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Lever (R. J. A. W.). **The Shot-hole Beetle Borer of Avocado Pear Trees.**—*Agric. J. Fiji* **9** no. 1 pp. 20–21, 2 pls., 2 refs. Suva, March 1938.

Xyleborus morstatti, Hag., the food-plants and distribution of which are briefly reviewed, was found infesting avocado on Taveuni Island [*cf. R.A.E.*, A **21** 625 ; **23** 270] in 1931, 1933 and 1937 and was taken at Suva on Viti Levu in January 1938. Measures suggested for control include probing the mines with a wire to kill the larvae, the destruction of badly infested branches, and painting the branches with various repellent mixtures.

Lever (R. J. A. W.). **Some Insect Pests of the Tahitian Chestnut.**—*Agric. J. Fiji* **9** no. 1 pp. 22–23, 1 pl., 1 ref. Suva, March 1938.

Larvae of *Argyroploce illepida*, Btlr., were found boring in fruits of *Inocarpus edulis* in Fiji in December 1937 and January 1938. The pupa forces its way through the skin of the fruit by stout spines at the apex, so that it partly protrudes before the emergence of the moth. This Tortricid has been recorded from various fruits in South Africa, India, Australia, China and Hawaii. It is parasitised by *Cremastus flavoorbitalis*, Cam. (*hymeniae*, Vier.), *Perisierola emigrata*, Rohw., and *Microbracon pembertoni*, Bridw., in Hawaii, and by a Tachinid of the genus *Winthemia* and two Braconids, the smaller being *Apanteles* sp., in Fiji. Other insects reared from fruits of *I. edulis* in Fiji included *Dacus* (*Chaetodacus*) *passiflorae*, Frogg.

Lever (R. J. A. W.). **Three Moths from Coconut Flowers.**—*Agric. J. Fiji* **9** no. 1 p. 23, 1 ref. Suva, March 1938.

The three Tineids recorded by Taylor from coconut flowers in Fiji [*R.A.E.*, A **18** 618] have been identified as *Batrachedra arenosella*, Wlk., which is the commonest and oviposits in the grooves of the unopened spathe, *B. atriloqua*, Meyr., which is almost as abundant and oviposits on the male flower-buds, and *Pyroderces paroditis*, Meyr., which oviposits on young male flowers or the fallen débris accumulated at the base of the palm leaves. Larvae of *P. paroditis* have been reared by the author from such débris in the Solomon Islands.

Yuasa (H.). **The Asparagus Beetles in Nippon (Japan).** [*In Japanese.*] *Kontyû* **12** no. 2 pp. 37–42, 2 figs. Tokyo, March 1938.

Descriptions are given of the adults of *Crioceris quatuordecimpunctata* var. *sibirica*, Weise, *C. orientalis*, Jac., and three new aberrations of the latter, which are injurious to asparagus in Japan.

Djou (Y. W.). **Life History notes on the Crucifer Sawfly.**—*Lingnan Sci. J.* **17** no. 1 pp. 83–86, 3 figs. Canton, 8th April 1938.

Descriptions are given of all stages of a sawfly (thought to be a species of *Athalia*) that attacks and sometimes severely injures the leaves of watercress at Canton, with records of some observations on its biology made in the spring of 1933. Larvae, apparently of successive generations, were collected in March, April and May, and the complete life-cycle of the May generation lasted about 30 days. The eggs were inserted individually in the edges of the leaves. Unfertilised females produced male offspring.

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Chu (C. V.). **Life History and Control of a few important Rice Insects in Kwangtung Province.** [*In Chinese.*]—*Probl. of Insects* 1 [10] pp. 2–6; (11) pp. 6–8; (12) pp. 1–8, 7 figs. Canton, 1936. (Abstr. in *Lingnan Sci. J.* **17** no. 1 pp. 106–107. Canton, 8th April 1938.)

Schoenobius bipunctifer, Wlk. (*incertellus*, Wlk.) and *Chilo simplex*, Btlr., are much the most serious pests of rice in Kwangtung, where both have five generations a year. Suggestions for control include winter ploughing, clean cultivation, the use of tobacco powder in the seed beds, removing infested parts of plants, cutting the rice close to the ground in harvesting [*cf. R.A.E.*, A **25** 638], and rotation of crops. The tobacco powder is dusted on the flooded field and kills the newly hatched larvae as they fall into the water. The seed beds should be prepared in strips 4 ft. wide, leaving paths along which workers may pass to collect the eggs and adults. The cutworm, *Cirphis* (*Leucania*) *unipuncta*, Haw., is injurious only in hot and dry weather, but caused severe damage in one district in 1935. There are six generations a year, adults appearing from late March to early October. Control methods are flooding, the use of poison baits, keeping ducks in the field, and cutting the plants close to the ground in harvesting. The Hesperiid, *Parnara guttata*, Brem., which has five generations a year, was very injurious locally in 1936. The larvae feed at night and may be controlled by dusting with a mixture of tobacco powder and lime or by flooding the fields, covering the water with a film of kerosene, and knocking the larvae from the plants with bamboo sticks. The oily water must be removed the next morning. *Hispa armigera*, Ol., destroyed 3,000 acres of early rice in the Poh-lo district in 1932; it has six generations a year and is also stated to attack turnip, sugar-cane, various other crops and weeds. The seed beds should be flooded in the morning so that the plants are nearly covered, and a rope should be drawn over them, dragging the larvae to the end of the bed, where they may be collected and destroyed. The Acridid, *Oxya chinensis*, Thnb., is a minor pest and much of the damage by cutworms is attributed to it. Control measures are digging up the egg-pods in the winter, keeping ducks in the field when the nymphs appear, and collecting by nets. Other rice pests include the Delphacid, *Saccharosydne procerus*, Mats., and the Pentatomid, *Scotinophara lurida*, Burm.

Feng (C. L.). **Cotton Insects in Kwangsi Province.** [*In Chinese.*]—*Insekto Interesa* **2** no. 7–9 pp. 73–74. Nantung, 1936. (Abstr. in *Lingnan Sci. J.* **17** no. 1 p. 110. Canton, 8th April 1938.)

Earias sp., *E. cupreoviridis*, Wlk., *Empoasca* (*Chlorita*) *biguttula*, Mats., *Sylepta derogata*, F., and *Platyedra* (*Pectinophora*) *gossypiella*, Saund., are all cotton pests in Kwangsi; notes on the bionomics of some of them are given. A list of the Chinese species of *Earias* is appended.

Pruthi (H. S.) & Narayanan (E. S.). **A Study of the Behaviour of some common Varieties of Sugarcane in Reference to the Attack of Borers at Pusa (Bihar) during 1935–36.**—*Proc. nat. Inst. Sci. India* **4** no. 1 pp. 87–107, 8 diagr., 6 refs. Calcutta, April 1938.

Details are given of the results of observations made at Pusa during the sugar-cane season of 1935–36 on the susceptibility to moth-borers (ascertained by monthly examination of dead-hearts) of five varieties of cane commonly grown in North Bihar. The varieties, given in order of increasing susceptibility to the stem-borers (*Diatraea sticticraspis*, Hmps., *D. venosata*, Wlk., and *Chilo zonellus*, Swinh.), were Co. 299 and 313, 331, 210, 213. The order for the root-borer (*Emmalocera depressella*, Swinh.) was: Co. 299 and 313, 210, 213, 331; and for the top-borers (*Scirpophaga nivella*, F., and *S. monostigma*, Zell.) it was Co. 313 and 331, 299, 213, 210. In general, the data obtained indicated that the adults of all three types of borer first emerge in March and soon oviposit. Dead-hearts first appear in April and reach their maximum number in June or July [*cf. R.A.E.*, A **25** 349, 529]. The activity of all the borers decreases during the monsoon months, but increases again soon after the rains. Top-borer damage is especially heavy in autumn and occurs almost throughout the year, whereas dead-hearts caused by stem- and root-borers are comparatively few in winter.

BRAHMACHARI (K.). **On the Bionomics of a Bagworm** (*Kophene cuprea* **M.**) **on Banana.**—*J. Bombay nat. Hist. Soc.* **40** no. 1 pp. 56–61, 1 pl., 6 figs., 5 refs. Bombay, April 1938.

Very little is known of the bionomics of Psychids in India, where *Chalioides vitrea*, Hmps., and *Pteroma plagiophleps*, Hmps., have recently been recorded as attacking tamarind at Coimbatore. In 1937, larvae of *Kophene cuprea*, Moore, were observed feeding on the leaves of banana near Madras. All stages of this pest and its habits are described. The egg larval, pupal and adult stages last a week, 2½ months, 7–8 days and 2–4 days, respectively. A female lays 200–300 eggs, and the larvae feed on the lower surface of the leaves, forming bags. Details are given of the process of bag-construction. As many as 150 larvae have been observed on a single leaf. They pass through 9 instars and pupate in their bags. Larval feeding causes the leaves to wither, and in severe cases the plant dies. No egg parasite was noted, but 2–5 per cent. of the larvae are attacked by a Tachinid. From another Psychid, *Clania crameri*, Westw., the author has bred the Ichneumonid, *Goryphus nursei*, Cam.

MAULIK (S.). **On the Structure of Larvae of Hispine Beetles.—V. (with a Revision of the Genus** *Brontispa* **Sharp.)**—*Proc. zool. Soc. Lond.* (B) **108** pt. 1 pp. 49–71, 18 figs. London, April 1938.

In this revision of the genus *Brontispa*, the author recognises only 11 valid species, and gives a key to them based on structural characters. He considers that *Oxycephala longipennis*, Gestro, *B. froggatti*, Sharp, *B. javana*, Weise, *B. selebensis*, Gestro, *B. castanea*, Lea, *B. simmondsi*, Maulik, and *B. reicherti*, Uhm., are synonyms of *B.* (*Oxycephala*) *longissima*, Gestro, that *B. sumatrana*, Weise, is a synonym of *Plesispa reichei*, Chap., and that *B. sarasini*, Heller, will have to be assigned to another genus. He has received a letter from Dr. A. Reyne, who states that the life-cycle of *B. longissima* requires about 52 days in Java (egg 4–5, larva 30, pupa 5 and maturation period 12 days). The adults lived for 2–3 months, and the average number of eggs per female was 117, yielding on an average 41 larvae.

The larvae of *B. longissima*, *B. linearis*, Spaeth, and *B. gleadowi*, Weise, are described in detail.

The Codling Moth (*Laspeyresia pomonella* **Linn.**).—*Palestine Gaz.* no. 776, *Agric. Suppl.* no. 28 pp. 78–82. Jerusalem, 21st April 1938.

A brief account is given of the bionomics of *Cydia* (*Laspeyresia*) *pomonella*, L., with notes on its seasonal history in Palestine, where it causes serious injury to apples, pears, quinces and walnuts. In the coastal plain, the first moths appear in March, and four overlapping generations may be produced in a long summer season, but the tendency to overwinter in larvae of any brood increases from July onward. In the hills, there is probably only a partial second generation. The usual control measures are recommended, and it is pointed out that basic lead arsenate must be used for spraying walnuts, as acid lead arsenate causes severe scorching of the leaves.

LEWIN (C. J.). **Northern Rhodesia Department of Agriculture. Annual Report for the Year 1937.**—23 pp. Lusaka, 1938.

Sections of this report (pp. 8–11) deal with insect pests, and particularly the infestation of cotton by *Dysdercus fasciatus*, Sign. [*cf. R.A.E.*, A **26** 366]. Results of observations on the life-history of *Anthores leuconotus*, Pasc., on coffee [**24** 510] were confirmed by further investigations, except that small larvae and eggs were found much later in the season. Of the total extractions of small larvae and eggs, 68 and 93 per cent., respectively, were made from January to March and 27 and 6½ per cent. from April to June. A minor Lamiid pest of coffee, *Dirphya* sp., was recorded for the first time.

JOURDAN (M. L.). **Observations sur le cycle annuel des générations de la sésamie du maïs au Maroc** (*Sesamia vuteria* **Stoll.**).—*C. R. Soc. Sci. nat. Maroc* 1938 no. 1 pp. 4–6. Rabat, 1938.

On the Atlantic coast of Morocco, the first generation of *Sesamia vuteria*, Stoll., develops from February to June on wheat, barley and oats. In March and April, at the beginning of the larval period, 5–10 larvae are found in one stalk, whereas when pupation occurs only one remains and some of the stalks are empty. It is thought that the larvae leave the stalks on which they have fed at about the fourth instar and go to fresh ones, as do those of the following generation. First-generation larvae pupate inside stalks of wheat, barley and oats. A very few of them enter into diapause and do not give rise to adults until the following winter. In 1937, first-generation adults were taken from 14th April until June, the greatest number apparently emerging during the second half of May. The adults of this generation oviposit on spring-sown cereals (maize, *Sorghum*, etc.). By mid-June, larvae of all instars are present, though newly-hatched ones are most abundant. Many congregate on one plant when young, but they move to fresh plants to pupate or enter into diapause. Adult emergence begins in July, but, as in the case of the preceding generation, is protracted, and causes the generations to overlap. Some larvae of this generation enter into diapause. In captivity, adults were observed in every month of the year, but it is stated in a footnote that an examination of the dates of capture of individuals in Rungs' collection showed that emergence is not so protracted in nature. These two generations appear to exist throughout the agricultural region of Morocco. In certain regions, there appear to be a third and fourth, able to develop on self-sown plants when cultivated ones are not available. In one coastal region (the Gharb), all stages were observed on late *Sorghum*, several weeks after the emergence of adults of the second generation, and at Casablanca, adults that had emerged in captivity oviposited from 15th to 24th October, and the resultant adults emerged on 12th January. According to [C.] Bleton there are three generations at Fès, developing, respectively, from the end of March to mid-June on wheat, barley and oats, from mid-June to mid-August on spring-sown cereals, and from September to the following spring on maize and various late graminaceous plants.

D'EMMEREZ DE CHARMOY (D.). **Réveil d'un parasite de la canne à sucre à la Réunion.**—*Rev. agric. Réunion* **42** pp. 311–314. Saint-Denis, December 1937. [Recd. June 1938.]

The Coccid, *Chionaspis tegalensis*, Zehnt., has recently been observed on sugar-cane of the variety Co. 290 in various parts of Réunion. It is thought that it has been on the island for a considerable time, but that the kinds of cane previously cultivated were not suitable for its development. It was usually found near the coast, but in one case was observed at a considerable altitude. It was preyed on by the Coccinellid, *Lindorus lophanthae*, Blaisd. The Coccids usually appeared on the young canes and remained until harvest without seriously affecting the crop. They were seldom present on the ratoons, unless new centres were built up by fields of young cane in the neighbourhood. Infestation spreads slowly, often from a shady point. The insects congregate on the stems around the nodes, and when abundant, form a thick scaly crust. Some other varieties of cane, a list of which is given, have been found susceptible. They are those with a tender rind and adherent and persistent sheaths. Though the Coccid has not yet caused much damage, care should be taken to use uninfested seed cane ; any that is suspected of being infested should be soaked for 24 hours in an emulsion of 4 gals. used engine oil, 1 gal. kerosene, 20 lb. soap and 100–200 gals. water. Very large centres should be destroyed by burning the cane at harvest time, and small ones treated when found by stripping and spraying the stems with the emulsion, the quantity of water being 100 gals. The treatment should be repeated after one month if necessary.

VAYSSIÈRE (P.) & LEPESME (P.). **Un dangereux parasite des grains emmagasinés** *Trogoderma granarium* **Everts.**—*Agron. colon.* no. 243 pp. 65–71, 4 figs., 9 refs. Paris, March 1938.

In view of the increasingly wide distribution of *Trogoderma granarium*, Everts, as a pest of stored grain, and the consequent danger of its establishment in France and the French colonies, its synonymy, geographical distribution and control are very briefly discussed, all stages are described and an account is given from the literature of its bionomics and the damage it causes.

BONDAR (G.). **Notas entomologicas da Bahia I, II.**—*Rev. Ent.* **7** fasc. 4 pp. 475–483, 8 figs. Rio de Janeiro, 11th October 1937; *op. cit.* **8** fasc. 1–2 pp. 1–24, 19 figs., 11 refs. 26th March 1938.

These two papers initiate a series of miscellaneous notes on insect pests in the Brazilian state of Bahia, based on the literature and on observations of the author. Sugar-cane is attacked by the Dynastids, *Ligyrus bituberculatus*, P. de B., which is common throughout Brazil, and *Euetheola* (*L.*) *humilis*, Burm. The former has also been recorded as killing banana by boring in the pseudostems. The fruits of avocado (*Persea gratissima*) are attacked by the larvae of *Stenoma catenifer*, Wlsm., and leaves by the larvae and adults of the Hispid, *Cephalodonta bryanti*, sp. n., and of the Curculionids, *Meroprion* (*Prionopus*) *perseae*, sp. n., *Prionomerus sexgibbosus*, sp. n., and *P. gudimiri*, sp. n. The first two of these new Coleoptera are described in the first paper, and the two species of *Prionomerus* in the second, which also includes notes on the bionomics of the flies, *Pantophthalmus vittatus*, Wied., and *P. gigas*, End., the larvae of which bore in the wood of various forest trees, and a list of 15 Lepidoptera attacking cultivated plants.

GIRAULT (A. A.). **Some new Australasian Insects which are Parasites (Hym. Chalcidoidea).**—*Rev. Ent.* **8** fasc. 1–2 pp. 80–89. Rio de Janeiro, 26th March 1938.

Among the new Chalcidoids described are *Stomatoceras imbili*, reared from *Hypsipyla robusta*, Moore, in Queensland, and *Epibootania nonvitta* [the Torymid previously recorded as *E. nonvittata*, Gir. (*R.A.E.*, A **22** 251)] from galls on *Citrus* in New South Wales.

FONSECA (J. P.). **Duas pragas do "Tungue" no Brasil.** [Two Pests of the Tung Oil Tree in Brazil.]—*O Biologico* **4** no. 3 pp. 72–75. S. Paulo, March 1938.

The tung-oil tree [*Aleurites fordi*], which is being increasingly grown in São Paulo, is infested by larvae of the Cerambycid, *Diploschema rotundicolle*, Serv., which also attack *Citrus*. The eggs are laid in cuts made in the bark of twigs, and the larvae, which are briefly described, tunnel downwards into the larger branches and trunk and expel frass, which falls under the tree. The pupal stage, which is passed in the mines, lasted about 20 days in February in the laboratory. Another pest, which was found in abundance on material from the state of Paraná, was the Coccid, *Aonidiella aurantii*, Mask., which does not appear to have been recorded hitherto from *Aleurites fordi*.

HEMPEL (A.). **Novas especies de Coccideos (Homoptera) do Brasil.**—*Arch. Inst. biol.* **8** pp. 5–36, 33 figs. S. Paulo, 1937. (With a Summary in English.)

One new genus and 20 new species of Coccids are described, two other species are recorded for the first time from Brazil, and notes are given on certain variations in the morphology of adult females of *Pseudococcus cryptus*, Hemp., from roots of *Citrus*.

HAMBLETON (E. J.). **A bróca do algodoeiro do Brasil,** *Gasterocercodes brasiliensis* **Hambleton (Col. Curcul.).** [The Brazilian Cotton Borer.]—*Arch. Inst. biol.* **8** pp. 47–106, 12 pls., 9 figs. S. Paulo, 1937. (With a Summary in English.)

Laboratory and field observations were made in 1935–36 at Campinas, São Paulo, on the bionomics of *Gasterocercodes brasiliensis*, Hambleton, on cotton [*cf. R.A.E.*, A **26** 115]. This weevil, all stages of which are described, also occurs in other states in Brazil and in the Chaco territory, Argentina. It caused a crop loss estimated at 30 thousand tons in São Paulo in 1935–36. It was observed breeding in the field on *Gossypium* spp., of which *G. purpurascens* was the most severely attacked and *G. trilobum* the least, *Hibiscus esculentus* and *H. sabdariffa*, and adults in captivity fed on a number of other malvaceous plants.

The adults feed at first on the stems and tender foliage of the growing plants, but later only on the stalks near the soil surface. The eggs are laid singly, in small cavities beneath the surface of the stem or root, and occasionally in the boll. The lower portion of the stem, near the ground, is preferred. The larvae bore into the centre of the stem or root, often killing the plant. In older plants, they are almost entirely confined to the area between the bark and the woody tissue, but make feeding galleries in all directions, often encircling the plant and causing its death. In heavily infested plants, eggs are laid in the aerial parts and larvae from them feed almost entirely on the pith. In green bolls, feeding is limited to the pericarp. Infested plants may wilt and die rapidly during hot weather, or their weakened foliage may turn a reddish-bronze. In plants that resist infestation and have no apparent symptoms in the aerial parts, the underground stem and roots often show large swellings, resulting from a proliferation at the point of attack, or they may become corky and the bark crack open.

Adult weevils spend the winter in cotton fields where remains of the old crop exist, or in places where malvaceous weeds occur. True hibernation has not been observed. Oviposition and development continue in the fields in winter if the plants are allowed to remain and temperatures are favourable. Overwintered females appear in new cotton fields in late September and October and oviposit from then until April. Females of subsequent generations lay eggs through the season and continue during the winter months. Conditions in the cotton-fields are conducive to winter survival, and adults survived in cages for about two months in winter when provided with dry cotton stalks for protection. The average longevity of females in an insectary was 200 days ; the maximum was 377 days. The males usually lived longer than the females, one surviving for 509 days. Weevils confined without food or water survived for 12 days. With water alone most of them died in 36 days, but one survived for 60. The maximum life of weevils caged with wild food-plants was 78 days.

Females paired soon after emergence and oviposited from 1 to 23 days later. First and second generation females in petri dishes oviposited for averages of about 21 and 24 weeks, the maximum for the former being about 48 weeks. The average number of eggs deposited per female was 159. Unfertilised females rarely oviposited, and their eggs did not hatch. The egg stage lasted 5–18 days with an average of 10·7 for the entire season, and the larval stage, which includes at least five instars, was completed in 29–88 days, varying with plant conditions and temperature. The mature larva forms a cell in the woody tissue and enters the prepupal stage, which lasted 1–9 days. The pupal period lasted 8–31 days, and averaged 15. The adult remained for 3–26 days in the cell, and then emerged through a circular hole that it cut in the bark at the end of the larval feeding tunnel near the cell. The average time required by 38 individuals to develop from egg to adult was 74 days during November–August. The sexes are about equal in numbers. The exact number of generations a year was not determined ; four partial generations is the maximum that could occur, but it is doubtful whether even one is complete.

Natural enemies considerably reduce the weevil population. Primary ectoparasites reared from the larvae comprised the Braconids, *Heterospilus gossypii*, Mues., *H. hambletoni*, Mues., and *H. annulicornis*, Mues., and the Pteromalid, *Eurydinoteloides longiventris*, Gah. [*cf.* **25** 510]. *H. gossypii*, the egg, larva and adult of which are described, was the most numerous. The adults were very active at about 25°C. [77°F.]; females paired on the day of emergence and oviposited on the paralysed, preferably mature, larvae of the host. The duration of development from egg to adult averaged 53·8 days at 19°C. [66·2°F.]. *H. hambletoni* had similar habits, but parasitised smaller larvae and was better able to find larvae in the lower parts of the plants, owing to its small size. From June to August its life-cycle averaged 43·1 days, of which 30·6 were passed in the cocoon. *E. longiventris* completed its development in an average of 46·5 days in June–September. In the field, not more than one egg or larva was observed on a host larva. Five other parasites were reared from plants infested by *G. brasiliensis*, but their status as parasites of it is doubtful. In captivity, some of the adult weevils were killed by the fungi, *Botrytis* sp. and *Verticillium* sp., and an ant, *Acanthostichus* sp., was observed to be predacious on larvae and pupae in the field.

The control measures advised include clean cultivation, the destruction of infested plants, and of all cotton plants after harvest, and crop rotation. Planting should be postponed until October, plenty of seed should be sown and the plants should not be spaced more than necessary.

PEREIRA (C.). *Rhabditis hambletoni* **n. sp., nema apparentemente semiparasito da "bróca do algodoeiro"** (*Gasterocercodes brasiliensis*). [*R. hambletoni*, sp. n., a Nematode apparently semi-parasitic in the Cotton Borer, *G. brasiliensis*.]—*Arch. Inst. biol.* **8** pp. 215–230, 12 figs., 6 refs. S. Paulo, 1937. (With a Summary in English.)

Descriptions are given of the larva and adults of both sexes of *Rhabditis hambletoni*, sp. n., found infesting dead larvae of *Gasterocercodes brasiliensis*, Hambleton, in cotton in Brazil. In experiments, the Nematode survived and bred only in dead or dying larvae of the weevil. The author describes its heterogonic life-cycle, and concludes that it is a semi-parasite of no economic importance.

HAMBLETON (E. J.). **A existencia da** *Platyedra gossypiella* **(Saunders) na floração dos algodoeiros em S. Paulo, durante 1936–1937.** [The Occurrence of *P. gossypiella* in the floral Parts of Cotton in S. Paulo in 1936–37.]—*Arch. Inst. biol.* **8** pp. 249–254, 2 pls. S. Paulo, 1937. (With a Summary in English.)

Notes are given on the infestation of cotton by *Platyedra gossypiella*, Saund., in São Paulo, Brazil [*cf. R.A.E.*, A **25** 378]. Investigations in 14 localities in the state in the summer of 1936–37 showed that the average percentage of infested buds, flowers and bolls was 40·29. The actual percentage varied from 1·6 to 94. Cotton growers have been warned not to plant earlier than October in order to avoid attack by *Gasterocercodes brasiliensis*, Hambleton, and this postponement would now appear even more advisable in order to prevent the development of severe infestation by *Platyedra* early in the season.

PLUMMER (C. C.). **The Toxicity of *Haplophyton cimicidum* A.DC. to Fruitflies.**—*Circ. U.S. Dep. Agric.* no. 455, 10 pp., 9 refs. Washington, D.C., April 1938.

The toxicity in bait-sprays for fruit-flies of an extract of the leaves of *Haplophyton cimicidum* [*cf. R.A.E.*, A **3** 37] was confirmed in experiments carried out in Mexico City in 1931–33 on *Anastrepha striata*, Schin., and *A. ludens*, Lw. The extract, which acts as a stomach poison, was prepared by boiling the pulverised dry leaves in water for an hour or more and straining. It was diluted and mixed with molasses for use. The plant is recorded from the south-western United States, Mexico, Central America and Cuba.

The following is based on the author's summary: Toxicity data are given for various conditions of temperature, and concentration, molasses content and age of spray. In the insectary, sprays remained toxic when kept for 58–59 days either in solution or mixed with molasses and dried on mango foliage. In the laboratory, sprays lost little of their toxicity after being kept 190 days in solution without molasses. Sprays mixed with molasses and kept dry on glass plates for 310 days at 30 or 35°C. [86 or 95°F.] and 30 per cent. relative humidity retained much of their toxicity. A spray kept in solution for 190 days, and then mixed with molasses kept dry on glass plates under similar conditions for 358 days, remained slightly toxic. An extract kept without molasses at room temperature for 527 days was not toxic. Sprays of the lowest molasses content (10 per cent.) were the most effective. A spray containing 3·3 gm. of a good sample of dried leaves per 100 cc. of diluted extract was toxic, but different samples of the plant varied in poison content, and some were not toxic. The fruit-flies became paralysed after having ingested sufficient sweetened extract and died in a few days. Chemical investigations indicated that the toxic material was an alkaloid or the salt or glucoside of one.

MEYERS (M. T.), HUBER (L. L.), NEISWANDER (C. R.), RICHEY (F. D.) & STRINGFIELD (G. H.). **Experiments on breeding Corn resistant to the European Corn Borer.**—*Tech. Bull. U.S. Dep. Agric.* no. 583, 29 pp., 1 diagr., 23 refs. Washington, D.C., October 1937. [Recd. May 1938.]

The following is based on the authors' summary: Details are given of experiments conducted for 7 years (1926–32), mostly in northern Ohio, in testing strains of maize suitable for growing under conditions of natural infestation by *Pyrausta nubilalis*, Hb. The percentage survival of larvae was lower as strains were later and also as planting dates were delayed, and egg deposition was less as strains were shorter in growth at the time of moth flight [*cf. R.A.E.*, A **18** 75; **19** 481]; but even when allowance was made for the effect on infestation of strain height at the time of oviposition and strain silking date, significant difference in infestation among the strains remained. In these experiments, considerably less than 100 per cent. of the stalks were infested in any season. Under such conditions, it should be possible to produce agronomically satisfactory hybrids that will have only about 80 per cent. as many borers as adapted open-pollinated varieties of similar growth rate and seasonal requirements. These hybrids are 10–20 per cent. more productive than the open-pollinated varieties, and at the present low levels of infestation, high productivity is the most important item in combating the borer. Apart from the inherently greater productiveness, their resistance will be of economic importance if infestation becomes considerably higher and if they maintain their relative resistance under the heavier infestation.

Bobb (M. L.). **Bait Traps for the Control of the Oriental Peach Moth.**—*Bull. Va agric. Exp. Sta.* no. 314, 14 pp., 2 figs., 14 refs. Blacksburg, Va, February 1938.

Baits and bait-traps for the control of *Cydia* (*Grapholitha*) *molesta*, Busck, were investigated in peach orchards in central Virginia during the seasons of 1935, 1936 and 1937. Water containing syrups, sorghum molasses or sulphite lye (lignin pitch) was used in the traps as a carrier, to which substances attractive to the moth were added after being emulsified with a mixture of 5 per cent. bentonite and water; 72 combinations were tested. The largest catch of moths for the experiments as a whole was given by a bait of 1 part sulphite lye to 20 parts water to which about 1 cc. terpinyl acetate per U.S. quart was added. This was the most effective bait in 1935 and 1937, but was second in effectiveness in 1936 to one with sulphite lye containing 1 cc. oil of anise and 1 oz. brown sugar per U.S. quart. Although there was practically no difference in the numbers of moths caught when the attractive substance was used at the rate of ½ or 1½ cc., it was best to use 1 cc. as the concentration was sometimes reduced by rain. The bait remains effective for about 4 weeks. Sulphite lye, which is an emulsifying agent, was a good carrier for the attractants, but attracted more moths alone than when some substances, such as ether oenanthic, were added to it. It was unnecessary to add yeast to syrup solutions in the spring to increase the rate of fermentation, or to add an inhibitor when sulphite lye was used as a carrier, but ⅙ oz. sodium benzoate, added to each U.S. quart of the syrup solutions to check fermentation, slightly increased the catch in the hot summer months; sodium arsenite [*cf. R.A.E.*, A **23** 53] was unsatisfactory as it favoured mould growth.

It was better to use U.S. quart glass fruit jars or cans for bait-traps than gallon containers, shallow pans or cones, and to have them well filled. When they were suspended at several different heights in peach trees, the traps in the tops of the trees captured 75·9 per cent. of all the moths caught; ¼ in. mesh wire screens over the tops of the traps decreased the catch by approximately 65 per cent. The largest catch was made in unpainted pails. Of the painted pails, the yellow ones gave the largest catch and black the smallest. Bright yellow and aluminium paints were the most satisfactory for protecting the traps.

Bait-traps containing sulphite lye and terpinyl acetate caught 10·8 moths each when suspended at the rate of about 18 per acre from 1st June to 16th July 1936 in a commercial orchard, but it is suggested that about 8 traps per acre would be sufficient. They should be suspended, preferably from standards in the open centres of the trees rather than from the limbs, about 25th April, so as to capture the moths as they emerge.

WOODSIDE (A. M.). **Chemically treated Bands for Codling Moth Control.** —*Bull. Va agric. Exp. Sta.* no. 315, 22 pp., 4 figs., 5 refs. Blacksburg, Va, March 1938.

An account is given of investigations on the preparation and use of chemically coated bands for the control of the codling moth [*Cydia pomonella*, L.] on apple in Virginia in 1934–37, and the results are tabulated. Strawboard bands, which were 2 ins. wide and had 36–40 corrugations per ft., were placed on the trees before mid-June each year (the dates subsequently recommended being 10th June in central and northern Virginia and a little earlier in the south) and were removed after harvest and examined. The coatings were considered efficient if they killed all larvae that entered the bands before 15th August ; those that enter later do not pupate before the winter and so can be destroyed when the bands are removed.

In the dipping mixtures tested, beta-naphthol, which was more effective than alpha-naphthylamine, and petroleum oil were used in the proportion of 2 lb. to 3 U.S. pints. The mixture was liquefied for the hot dips by heating to 265–270°F. [*cf. R.A.E.*, A **25** 92], and for the cold ones by adding petrol that contained no tetra-ethyl lead [*cf.* **25** 617]. The former method was abandoned after the first season because of the difficulty of obtaining a uniform coating, but it gave a coating of 11 oz. per 25 linear feet of band, which was efficient, when the bands were dipped to half their width, turned, and dipped again to the same depth. When the bands were similarly dipped to ¾ of their width in the same mixture and in one in which crankcase drainings replaced the petroleum oil, the weights were 13 and 12·2 oz., respectively. Two complete dips raised it to nearly 1 lb.

The minimum efficient coating by the cold-dip method (9 oz. after the petrol had evaporated) was given by dipping to half the width, turning and dipping again, in a colloid-mill mixture of the beta-naphthol and oil, to which was added 2 U.S. pints petrol. Two ¾ dips gave coatings of 11 12·2 oz., and one of 10 oz. was obtained by two dips to half the width in 5 lb. Cod-Ban [*cf.* **25** 617] and the same amount of petrol. Later experiments showed that Cod-Ban bands gave better results than those made from powdered beta-naphthol and oil. The substitution in the mixture of crankcase drainings for new oil (670 and 250 secs. Saybolt, respectively), or the addition to the petrol of aluminium stearate to make the coating remain soft and oily longer and hinder flaking off [*cf.* **25** 619] did not affect the weight of the coating, but increased its lasting qualities. In 1937 satisfactory coatings were given by two ¾ dips when 2 U.S. pints petrol was added to an ordinary mixture of beta-naphthol and oil or to 4 lb. Cod-Ban. Kraft-faced and jute-faced paper did not differ consistently in the weights of coatings received or in the number of tunnels clogged [but *cf.* **25** 617]. Bands with heavier coatings lost a smaller percentage of the total coating, and particularly of beta-naphthol, than did others. Examination of sample trees and the ground under them in different years showed that from 42 to 73 per cent. of the larvae from them had spun their cocoons in or under the bands. The percentages were highest on trees that had little loose bark or other shelter. On comparable trees in 1937 the percentage of infested apples was reduced by banding from 2·4 to 1·6. Directions for banding are given and its cost is discussed.

BOYCE (A. M.) & MABRY (J.). **The Greenhouse Thrips on Oranges.**—*Calif. Citrogr.* **23** no. 1 pp. 19–20, 28, 29, 2 figs., 1937. (Abstr. in *Exp. Sta. Rec.* **78** no. 6 pp. 819–820. Washington, D.C., 1938.)

The greenhouse thrips [*Heliothrips haemorrhoidalis*, Bch.] was an important pest of Valencia oranges at Rancho Santa Fe, California, during the summer of 1936. Laboratory tests showed that pyrethrum, nicotine sulphate, dinitro-ortho-cyclohexylphenol, and lethane (a proprietary aliphatic thiocyanate compound) applied in various dust mixtures were very effective in killing the thrips. Rotenone-bearing dusts were relatively low in effectiveness. In field tests, high initial kills were obtained with pyrethrum and dinitro-ortho-cyclohexylphenol, whereas the other materials gave either variable or poor results. None of these dusts, however, had sufficient residual toxic action to kill thrips that hatched after they had been applied, so that they would require too frequent applications to be used for control. A programme suggested for 1937 was the inclusion of either pyrethrum extract or nicotine sulphate (1 : 1,200) in the regular late summer oil spray for scale insects and the citrus red mite [*Paratetranychus citri*, McG.].

BECKWITH (C. S.). **Control of the Blunt-nosed Leafhopper.**—*Proc. Amer. Cranb. Gr. Ass.* **68** (1937) pp. 9–14. (Abstr. in *Exp. Sta. Rec.* **78** no. 6 p. 822. Washington, D.C., 1938.)

Experience in New Jersey has shown that the relative effectiveness of different measures against the blunt-nosed leafhopper [*Euscelis striatulus*, Fall.] on cranberry may vary with surrounding conditions; it is therefore desirable to ascertain the abundance of the leafhopper before and after a treatment by making collections with a net. Aeroplane dusting with pyrethrum is a treatment generally employed, owing to the ease of application.

DOEHLERT (C. A.). **Biological Testing of Pyrethrum Dusts with the Blunt-nosed Leafhopper.**—*Proc. Amer. Cranb. Gr. Ass.* **67** (1936) pp. 17–22. (Abstr. in *Exp. Sta. Rec.* **78** no. 6 p. 822. Washington, D.C., 1938.)

A description is given of a laboratory method of testing the relative effectiveness of different pyrethrum dusts against *Euscelis striatulus*, Fall., and the results of tests are given in tables.

DOEHLERT (C. A.). [**Notes on Dusting for the Blunt-nosed Leafhopper** *Euscelis striatulus* **Fall.**].—*Proc. Amer. Cranb. Gr. Ass.* **68** (1937) pp. 24–27. (Abstr. in *Exp. Sta. Rec.* **78** no. 6 pp. 822–823. Washington, D.C., 1938.)

Experiments in New Jersey showed that morning dew does not interfere with the efficiency of pyrethrum dusts against *Euscelis striatulus*, Fall., on cranberries. The kill (about 98 per cent.) obtained from the application of impregnated and of activated dusts was nearly the same as that from pyrethrum flowers. As the amount of impregnated dusts used (2 per cent. pyrethrins) was only one-sixth the weight of the flowers and the pyrethrin content of the activated dust about two-thirds that of the flowers, there appears to be an opportunity for considerable saving.

MARCOVITCH (S.). [**Lima Beans attacked by the Corn Earworm.**]—*Proc. Ass. Sth. agric. Wkrs* **37–38** (1936–37) p. 277. (Abstr. in *Exp. Sta. Rec.* **78** no. 6 p. 825. Washington, D.C., 1938.)

Several hundred acres of lima beans in Tennessee were almost completely destroyed in September 1936 by the corn earworm [*Heliothis armigera*, Hb.], owing largely to the absence of the silk stage of maize, its preferred food-plant. It had become abundant as a result of the hot, dry summer, and when the larvae suddenly appeared on lima beans they devoured the pods too rapidly for effective application of sprays by the limited machinery available. To meet the emergency, several baits were spread over the fields ; the best results were obtained from cottonseed meal with 5 per cent. of sodium fluosilicate applied at the rate of 100 lb. per acre. The cost of this treatment is low, as the cottonseed meal acts as a fertiliser, and large areas can be rapidly covered. Except in an emergency, reliance should be placed upon maize planted as a trap-crop in adjacent fields to silk at about the time that the beans begin to bloom.

PUTMAN (W. L.). **Further Notes on some alternative Hosts of the Oriental Fruit Moth Parasite,** *Glypta rufiscutellaris*, **Cress.**—*Canad. Ent.* **70** no. 5 pp. 89–90. Orillia, May 1938.

The leaf tier on hawthorn [*Crataegus*] that is a host of *Glypta rufiscutellaris*, Cress., in Ontario [*R.A.E.*, A **23** 372] has been tentatively identified as *Epinotia laracana*, Kearfott. The adult moths emerged on 22nd March in 1935 and 15th April in 1936, these being the first days in each year when the temperature reached 60°F. In 1935 young larvae were found in the swelling buds of hawthorn on 2nd May and they matured early in June, spinning cocoons in the soil and pupating in the autumn. In the summer of 1935, the percentage parasitism of this Tortricid by *G. rufiscutellaris* was 20 and the identity of the parasite was confirmed by an experiment in which an unfertilised female parasitised newly hatched larvae of the oriental fruit moth [*Cydia molesta*, Busck] exposed to it on 20th and 21st July, 12 males emerging from this material on 19th–25th August. From collections of *Epinotia* made in 1934 and 1935, adults of *G. rufiscutellaris* emerged from 19th to 23rd June and from 29th June to 9th July, respectively, but no parasites were reared from collections in 1936 and 1937. The oak leaf-roller, *Argyrotoxa semipurpurana*, Kearfott [*loc. cit.*] was exceedingly scarce and no material for study was obtained. Although these two hosts of the spring generation of *Glypta* are too scarce or local to be of much practical value, they do indicate that such a generation exists, the most important hosts of which have not yet been discovered.

It has been shown [**24** 475] that adults of *Glypta* emerging from *Epiblema strenuana*, Wlk., in the spring may live long enough under favourable conditions to parasitise second-generation larvae of *C. molesta*, but it is improbable that such survivors could produce the high rate of parasitism often found. In Ontario, the spring emergence of *Glypta* from *Epiblema* occurred during 8th–24th May in 1935, and 4th–14th May in 1936, whereas second-generation *molesta* larvae usually do not appear until the end of the first week in July. The next generation of *Glypta* from *Epiblema* does not emerge until mid-August to mid-September.

Epiblema was generally abundant throughout the Niagara Peninsula from 1934 to 1937 with only minor fluctuations. Parasitism by *Glypta* on the overwintering and first generations, respectively, was 23 and 15 per cent. in 1935 and 21 and 9 per cent. in 1936. *Macrocentrus delicatus*, Cress., was less abundant than *Glypta* on the overwintering generation of *Epiblema*, but much more so on the first. Only two individuals of *M. ancylivorus*, Rohw., were recovered, one from each generation, and only one of *Cremastus forbesi*, Weed, but *C. minor*, Cush., was common on both generations. A list is given of other parasites that have been consistently reared in considerable numbers from both generations of *Epiblema*, but which, unlike those mentioned above, are not known to attack *C. molesta*. Further hosts from which *G. rufiscutellaris* was reared in 1935 and 1936 were *Epiblema scudderiana*, Clem., and *E. obfuscana*, Dyar, on golden rod [*Solidago*] and *Cydia* (*Melissopus*) *latiferreana*, Wlsm., in acorns. Both the hosts and parasites were too scarce to have any influence on the *Glypta* population in peach orchards.

ALLMAN (S. L.). **Codling Moth Control. Results of Tests at Young.**—*Agric. Gaz. N.S.W.* **49** pt. 4 pp. 217–220, 230, 2 figs. Sydney, 1st April 1938.

In the summer of 1936–37, emergence of the overwintered brood of the codling moth [*Cydia pomonella*, L.] in New South Wales began on 6th October and reached a peak in mid-November; the peak of first-brood emergence was in early February. In experiments on control, a calyx spray was applied on 13th October to 4 varieties of apple and was followed at intervals of approximately 3 weeks by 7 cover sprays. The first 3 sprays on all plots consisted of 2 gals. lime-sulphur, 2½ lb. lead arsenate, ½ lb. spreader, and 2 lb. hydrated lime in 80 gals., but different materials were used for the 5 remaining cover sprays. The percentages of control with the following materials in these sprays (all in 80 gals. water) were: 93·7 with 2½ lb. lead arsenate and ¼ lb. spreader in 1 per cent. white oil; 92·6 with 1 pint nicotine sulphate in 1 per cent. white oil; 91·8 with 2½ lb. lead arsenate and ¼ lb. spreader; 86·8 with 2½ lb. thiodiphenylamine; 85·9 with 2½ lb. bentonite-sulphur and ½ pint nicotine sulphate; and 79·1 with a derris preparation in 1 per cent. white oil. Severe injury to the fruit, accentuated by very hot weather, resulted from the third application of lead arsenate and lime-sulphur. Bentonite-sulphur and nicotine sulphate left a heavy residue that could not be removed by wiping. Thiodiphenylamine left a dark deposit that was easily removed by wiping, but its odour persisted until harvest. Nicotine sulphate and white oil gave good control without excessive residues of lead arsenate.

When applications of lead arsenate were continued throughout the season, the residues greatly exceeded the tolerance, but this was overcome to a considerable extent by the harvesters wearing woollen gloves and wiping the apples when picking them. A spray of sodium silicate applied before harvesting apparently reduced the residue considerably.

BEDFORD (H. W.). **Entomological Section Agricultural Research Service. Report—Season 1935–36.**—*Rep. agric. Res. Serv. Sudan 1936* pp. 38–52. [Wad Medani, 1937]. [Recd. May 1938.]

This is a general survey of insect pests in the Anglo-Egyptian Sudan during 1935–36 and of experimental work. *Platyedra gossypiella*, Saund., was generally less abundant on cotton than during the previous season [*cf. R.A.E.*, A **25** 216]. In the Gezira, the reduced infestation is attributed to the lateness of the crop, the destruction during early September of large quantities of old sacks containing infested seed-cotton, and the prolonged cool weather during the winter. In the Berber and Shendi districts, 0·5–4 per cent. of *Hibiscus esculentus* was infested by *P. gossypiella* from October to January, and 4 per cent. of the fruits of *Corchorus olitorius* were attacked early in August. A table indicates that emergence of adults from the resting stage during the period June–November in the Gezira was associated with a rise in humidity. The presence of a resting stage in the Nuba mountains and the south was established. Infestation in the Nuba mountains was higher in fields remote from human habitations than in those near them; during July and August 1935, 8 per cent. of the bolls produced on standover cotton were infested.

Infestation of cotton by *Earias insulana*, Boisd., was slight to normal in most areas. In the Berber and Shendi districts, it varied from 7 to 28 per cent. of the bolls in October. Infestation of fruits of bamia [*Hibiscus esculentus*] was conspicuous in the Merowe district. In Kordofan Province, this bollworm was more abundant on its natural food-plants than on cotton until they dried up through shortage of water. *Diparopsis castanea*, Hmps., was the commonest bollworm in Kordofan Province from August to November; in most other districts it was absent or inconspicuous. Its absence in the Merowe district was attributed to the lack of rain and a crop maturing later than that in Berber. In the Berber and Shendi districts, 6 cultural methods were compared for the control of *D. castanea* in the resting stage. Ploughing only was the least successful; heavy watering, with or without ploughing, and ploughing and levelling gave good control. *Heliothis armigera*, Hb. (*obsoleta*, F.) appeared in numbers on cotton in the Gezira at the end of October, and the adults were attracted to *Dolichos lablab* as soon as it began to flower. Cultural operations were applied in May to small plots artificially infested with large numbers of the larvae. Uncultivated, ploughed and cultivated plots had, respectively, 7, 0 and 0 live pupae, and 28, 16 and 19 dead pupae a month after treatment, and 4, 0 and 0 moths emerged from sections of them that had been left undisturbed under cages. Varieties of maize known to attract this bollworm in South Africa proved no more attractive than local varieties.

Collections of all buds, flowers and bolls shed on experimental cotton plots showed that in the Berber district excessive shedding early in the season is due chiefly to causes other than bollworms. In the Nuba mountains, *D. castanea* caused most shedding, *E. insulana* was second in importance, *H. armigera* caused more in October than the other months, and the amount due to *P. gossypiella* was negligible. In

December, most was caused by *E. insulana*, followed by *D. castanea* and *P. gossypiella* ; *H. armigera* caused none. Collection of all shed parts from four plots sown at monthly intervals from 15th May to 15th August in a locality in the south showed that shedding is heaviest at a certain stage in the growth of the plant and that, in this, bollworms are not the chief factor. The percentage of shedding due to them was small and, in cotton sown at the same time as the main crop, never exceeded 20 per cent. It was caused by *P. gossypiella*, *E. insulana* and *H. armigera*.

In the Nuba mountains, damage to cotton by *Dysdercus* spp. was inconspicuous, except in certain areas where control measures had not been carried out. The ratio of *D. fasciatus*, Sign., to *D. superstitiosus* F., was approximately 8 : 1, and *D. nigrofasciatus*, Stål, was rare. In the south, stainers were found throughout the cotton crop, but were not so abundant as in uncontrolled areas in the mountains. The average damage in the Maridi district during December, when they were most numerous, was 10–15 per cent. of green bolls. In the Torit district, 30 per cent. of the bolls were affected at the end of the season. *D. superstitiosus* was the most abundant species, *D. cardinalis*, Gerst., was rare in the Maridi district, but more plentiful at Torit, while *D. nigrofasciatus* was widely distributed, but never plentiful. Observations in the Nuba mountains indicate that *D. fasciatus* passes the dry season chiefly on *Adansonia digitata* growing on cotton soil and to a minor extent round water holes where seeds have been scattered. When the rains come, dispersal to *A. digitata* on gravel soil takes place, after which the latter is liable to become heavily infested. *D. superstitiosus* bred on it during the early rains and until September, but no breeding on alternative food-plants was observed during the dry season. In the south, herbaceous Malvaceae were suitable food-plants for all species ; there was active breeding on kapok near dwellings during September, followed by breeding during December and January on *Sterculia cinerea* and *S. tomentosa*. A list is given of the food-plants on which breeding by *D. superstitiosus*, *D. nigrofasciatus* or *D. cardinalis* was recorded. In the Tokar Delta, *D. superstitiosus* bred in small numbers on *Abutilon* sp. and *Hibiscus esculentus* among cotton, but not on the cotton itself. *Oxycarenus hyalinipennis*, Costa, was fairly common in open cotton bolls at the end of the season in the Nuba mountains. In the south, this and an unidentified species of the same genus were abundant on cotton, while *O. rufiventris*, Germ., and another unidentified species were less plentiful.

Damage to cotton by termites was fairly extensive in some districts, and plants that were apparently vigorous were attacked. Digging poisoned *Dolichos lablab* into the soil in November did not reduce injury during the following season. Naphthalene applied at the rate of about 100–150 lb. per acre gave results inferior to those given by sawdust and 1 per cent. Paris green, which is cheaper and, at about 510 lb. per acre, reduced losses of stand from 5 to 0·4 per cent. There was no apparent relationship between the loss of stand of cotton and the loss in weight of wooden pegs used to estimate the distribution of the termites. Damage by *Sphenoptera gossypii*, Cotes, has been greatly reduced in the Gezira since the introduction of the practice of pulling out the cotton sticks at the end of the season. *Bemisia gossypiperda*, Misra & Lamba, was less plentiful in the Gezira than in the previous season, probably on account of the poor and late growth of *Ipomoea cordofana*. It was present on cotton in normal numbers in the north, but was far more numerous on *D. lablab*, *H. esculentus*, beans and tomatos. *Hercothrips fumipennis*, Bagn. & Cam., appeared on cotton and garden seedlings in the Gezira early in October, immediately after the drying up of *Crotolaria* sp., and caused severe leaf-shedding in some areas. *H. sudanensis*, Bagn. & Cam., occurred in small numbers only, but in the north it was the commoner species, though it caused negligible damage to cotton. Both species caused leaf-shedding on older cotton in Kassala Province, and unidentified thrips caused considerable defoliation in some areas of the White Nile. *Aphis gossypii*, Glover, was plentiful in the White Nile Province and caused much leaf-shedding. It was present throughout the southern area from August to October and caused marked curling of the young leaves.

Helopeltis bergrothi, Reut., attacked cotton in southern districts from September to February, and its numbers increased on alternative food-plants in December and January. Very little difference was found in the infestation of cotton sown on various dates. The most important alternative food-plants were *Bauhinia reticulata*, guava, sweet potato, *Combretum* sp. and *Bidens pilosa*. Under insectary conditions, the life-cycle from egg to adult lasted 35-42 days. Punctures on the bolls seldom penetrate beyond the boll-wall, and most of the bolls open normally. Both adults and nymphs attack the growing point of a plant, causing stunting and distortion. Leaf-punctures appear as transparent spots that later turn brown and dry up ; young leaves often curl downwards. Damage to petioles, branches and stems starts with a gradual change of colour of the area attacked. The Capsids, *Campylomma nicolasi*, Puton & Reut., and *Creontiades pallidus*, Ramb., occurred in various degrees of abundance on cotton in different parts of the northern Sudan, the latter being suspected in one area of being connected with boll rot. Jassids were numerous in some parts ; the chief species was *Empoasca libyca*, Berg., but *Scaphoideus aegyptiacus*, Mats., occurred in numbers in two districts. Early in December, " hopperburn " was observed on cotton plants in cages into which *E. libyca* had been introduced a month earlier.

Podagrica puncticollis, Weise, caused serious damage to young cotton in two districts. In the Gezira, *Acontia* (*Xanthodes*) *graellsi*, Feist., normally a minor pest of annual occurrence, also caused severe damage to young cotton on an area overgrown with weeds, chiefly *Ipomoea cordofana*. The larvae were full-fed by the end of September, and those kept in the laboratory gave rise to adults 2–3 weeks later, but no further attacks were noticed in the field. Other Lepidoptera locally injurious to cotton were *Laphygma exigua*, Hb., *Sylepta derogata*, F., and *Euproctis producta*, Wlk. (*rubricosta*, Fawcett), which was also noted on wild castor (*Ricinus communis*).

The pests injurious to *Sorghum* included those noticed from the previous year's report [**25** 218], as well as *Aphis sorghi*, Theo., and *Tanymecus sparsus*, Fhs. At Tokar, sterility of heads of *Pennisetum typhoideum* noticeable during January was proved to have been caused by the larvae of a Cecidomyiid, probably *Cecidomyia* (*Itonida*) *seminis*, Felt. During a survey of date palms in Berber in October, two species of Tetranychid mites were observed on the foliage, *Parlatoria blanchardi*, Targ., was the most widely distributed Coccid, but caused negligible damage, and the Buprestid, *Julodis caillaudi*, Latr., was, in places, responsible for considerable damage to the leaves.

Sawn planks of *Isoberlinia doka* steeped in a river for 45 days were still subject to attack by *Lyctus*, but steeping for 24 hours in various solutions, including creosote and kerosene (1 : 8), sodium arsenite (2 per cent.), zinc chloride (5 per cent.) and sodium fluoride (3½ per cent.) has protected them for nearly two years. Planks of various kinds of wood treated with sodium fluosilicate were not attacked by *Lyctus*, other borers or termites, but dipping in 1 per cent. sodium fluosilicate for 2 minutes does not protect cut timber from *Sinoxylon* spp., owing to subsequent lifting of bark and cracking of the timber.

BALLARD (E.). **Report by the Chief Plant Protection Officer for the Year 1st April 1936 to 31st March 1937.**—*Rep. Dep. Agric. Palestine 1936–37* pp. 97–103. Jerusalem, 1938.

In the year under review, infestation of *Citrus* in Palestine by the Mediterranean fruit fly [*Ceratitis capitata*, Wied.] was comparatively light in the Jordan Valley, but very severe on the coastal plain [*cf. R.A.E.*, A **26** 77]. In the spring of 1937, almond foliage in one district was damaged by *Diloba coeruleocephala*, L. The plum sawfly, *Hoplocampa* sp., appears to be widely distributed in the plum orchards on the hills.

ISHII (G.). **Morphology and Ecology of *Megatoma varius* Mats. et Yokoy. (Dermestidae.)** [In Japanese.]—*Bull. seric. Exp. Sta.* **9** no. 3 pp. 125–150, 2 pls., 2 figs. Tokyo, 1937. (With a Summary in English.)

Descriptions are given of all stages of *Megatoma varius*, Mats. & Yokoy., a Dermestid that has not been observed outside Japan. Near Tokyo, it usually has 1–3 generations a year, but some individuals take 2 or 3 years to complete a life-cycle. The adults emerge from June to September ; both sexes live for 15–40 days if pairing occurs, and unfertilised females may survive for 60 days. The females begin to oviposit 1–2 days after pairing and lay up to 115 eggs, the maximum rate being 70 per day. The egg and pupal stages last 5–16 and 3–14 days, respectively, and the larval stage varies from about a month to over a year. The larvae feed on dried animal specimens, woollen clothes, pupae and eggs of the silkworm [*Bombyx mori*, L.], and silk cocoons and raw silk, but do not complete development on the last two. They hibernate in groups in sheltered places. Fumigation with chloropicrin or hydrocyanic acid gas is effective for control.

ISHII (G.). **The Life-history and Habits of *Orphiloides ovivorus* Mats. et Yokoy. (Dermestidae.)** [*In Japanese.*]—*Bull. seric. Exp. Sta.* **9** no. 3 pp. 151–167, 2 figs. Tokyo, 1937. (With a Summary in English.)

The larvae of the Dermestid, *Orphiloides ovivorus*, Mats. & Yokoy., live as parasites in the egg-masses of Mantids in Japan and Formosa. Near Tokyo, where it parasitised 50 per cent. of the egg-masses of *Paratenodera sinensis*, Sauss., in 1928, it has two generations a year. The winter is passed in the larval stage, and the adults emerge from May to September. Males and females live about 20–24 and 20–35 days, respectively. Although 41–139 eggs may be found in an egg-mass of the host, less than 70 larvae complete development. The egg, larval and pupal stages last 5–11, 59–66 and 7–9 days, respectively, in summer.

TAKIO (M.). **Morphology and Ecology of** *Dermestes vorax* **Motsch.** [*In Japanese.*]—*Bull. seric. Exp. Sta.* **9** no. 3 pp. 167–184, 1 pl. Tokyo, 1937.

The larvae of *Dermestes vorax*, Motsch., all stages of which are described, feed on dried pupae and cocoons of silkworms [*Bombyx mori*, L.] and other animal matter in Japan. Near Tokyo, it has one partial generation a year. The adults, which hibernate, emerge in July and August ; males live 404–557 days and females 355–538. Females deposit about 170 eggs at the rate of 3–5 per day. The egg, larval and pupal stages last 5–11, 43–80 and 9–12 days, respectively. Fumigation with carbon bisulphide, hydrocyanic acid gas or chloropicrin is effective in control.

KUROSAWA (T.). **Morphology and Ecology of** *Trinodes hirtus*, **Fab. (Dermestidae.)** [*In Japanese.*]—*Bull. seric. Exp. Sta.* **9** no. 3 pp. 185–204, 2 pls., 3 figs. Tokyo, 1937. (With a Summary in English.)

Descriptions are given of all stages of *Trinodes hirtus*, F., which feeds on raw silk, dried pupae and adults of the silkworm [*Bombyx mori*, L.] and other animal matter in Japan. It has one generation a year and overwinters as a mature larva. Pupation occurs in late April and early May, and the adults emerge 11–23 days later. The females, which live 31–75 days, begin to oviposit about 10 days after pairing. They deposit 50–60 eggs, which hatch in 8–23 days.

FUKAYA (S.). **Influence of Temperature and Humidity upon the Capacity for Oviposition of** *Trichogramma japonicum* **Ash.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **10** no. 2 pp. 41–52, 4 figs. Tokyo, May 1938.

In experiments in Japan on rearing *Trichogramma japonicum*, Ashm., in eggs of *Ephestia cautella*, Wlk. [*cf. R.A.E.*, A **25** 746], a temperature of 20–25°C. [68–77°F.] and over 70 per cent. relative humidity were optimum for oviposition, the number of eggs deposited increasing as the temperature rose from 13·75 to 21·9°C. [56·75 to 71·42°F.]. The number gradually decreased from 25 to 35°C. [95°F.]. The eggs were killed by exposure to 38°C. [100·4°F.] and 90 per cent. humidity for 24 hours, but the larvae generally developed under these conditions. The development of the host egg was not impaired by the presence of the dead parasite egg in it, or by the insertion of the ovipositor of the parasite.

MINAKAWA (S.). **On the Morphology of the Larvae and Biology of** *Semanotus japonicus* **Lacord. and** *Callidium rufipenne* **Motsch.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **10** no. 2 pp. 53–68, 3 figs. Tokyo, May 1938.

Descriptions are given of the immature stages of the Cerambycids, *Semanotus japonicus*, Lacord., and *Callidium rufipenne*, Motsch., which attack *Cryptomeria japonica* and other conifers in Japan. Near Tokyo, the adults of *S. japonicus* emerge from early April to early June. They live for about 8 weeks and the females deposit 21–30 eggs, usually 2 at a time, in cracks on the trees. The larvae hatch in 10–14 days, bore into the inner layers of the bark and then into the wood. The prepupal and pupal stages last about 30 and 20 days, respectively, and the adults overwinter in the pupal cells. The bionomics of *Callidium rufipenne* are similar, but females usually lay rather fewer eggs. These Cerambycids chiefly attack trees about 30 years old, sometimes killing them, and often occur together in the same tree. *S. japonicus* is parasitised by *Thalessa superbiens*, Morley, and *Callidium rufipenne* by *Xylonomus sapporensis*, Uch., and some unidentified species of Ichneumonids and Braconids.

YAMAZAKI (T.). **Emergence of the Adults of** *Anomala xanthopleura*, **Arrow.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **10** no. 2 pp. 74–77, 1 fig. Tokyo, May 1938.

The larvae of *Anomala xanthopleura*, Arrow, which is common in the Loochoo Islands and very injurious on Miyako, feed on the roots of sugar-cane, wheat and other grasses, while the adults attack *Acacia confusa*, *Hibiscus tiliaceus* and *Terminalia catappa*. The adults usually begin to emerge in May, and the population increases suddenly to a peak in mid-June or early July and decreases just as abruptly in late July or August.

TAMURA (I.). **Influence of Light upon the Volume of Food taken by positively phototropic Scarabaeidae.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **10** no. 2 pp. 78–80. Tokyo, May 1938.

Adults of *Anomala rufocuprea*, Motsch., consumed a greater number of leaves of soy bean when kept in a dark room than when exposed to a continuous light of 8 candle-power.

KÔNO (H.). **On** *Laspeyresia strobilella* **L. (Tortricidae), a new Pest of** *Picea jezoensis*. [*In Japanese.*]—*J. Sapporo Soc. Agric. For.* **29** no. 142 pp. 517–520, 1 fig. Sapporo, Japan, March 1938.

Cydia (*Laspeyresia*) *strobilella*, L., all stages of which are described, has one generation a year in Hokkaido, the adults emerging in May or June. The larvae feed on the cones of *Picea jezoensis*, sometimes attacking the seeds, and hibernate when full-fed. In one forest in 1937, 97 per cent. of the cones were infested, 1–10 larvae being found in each. The larvae are parasitised by a Braconid and four species of Ichneumonids, including *Pimpla* (*Epiurus*) *glycinivorellae*, Uchida.

KÔNO (H.). **Studies concerning Insect Pests of** *Abies sachalinensis* **and** *Picea jezoensis*. (**Preliminary Report.**) [*In Japanese.*]—*Abstr. Stud. Hattori Hoko-Kai* no. 5 pp. 271–277, 3 pls. Tokyo, March 1938.

Some 200 species of insects occur on *Abies sachalinensis* and *Picea jezoensis* in Hokkaido and Saghalien ; a list of 110 that are among the more important ones is given in this paper. Those that attack healthy trees and sometimes injure them severely include *Dendrolimus jezoensis*, Mats., *D. albolineatus*, Mats., *Lymantria monacha*, L., and certain sawflies and Aphids. *Hylecoetus cossis*, Lewis, *Monochamus sartor* var. *rosenmülleri*, Ceder., and various Scolytids and weevils [*cf. R.A.E.*, A **26** 452] usually infest weakened trees and sometimes kill them.

Sonan (J.). **On** *Phassus signifer* **Walk. and** *Palpifer sexnotatus* **Moore var.** *ronin* **Pfitz.** [*In Japanese.*]—*Formosan agric. Rev.* **34** no. 378 pp. 410–416, 2 figs. Taihoku, May 1938.

Descriptions are given of all stages of *Phassus signifer*, Wlk., of which *P. formosanus*, Shir., is considered a synonym. In Formosa, the adults occur from March to September, and the larvae bore in teak (*Tectona grandis*) and *Paulownia tomentosa*, to which they are very injurious, and also in *Bischofia javanica*, *Melia azedarach* and willow. Collecting the larvae and introducing a stomach poison or chloropicrin into the tunnels are recommended for control. Another Hepialid, *Palpifer sexnotatus* var. *ronin*, Pfitz., the adult and larva of which are described, attacks the subterranean parts of *Colocasia antiquorum* var. *esculenta* and kills the plant. It sometimes causes extensive damage in the mountainous regions. Infested plants should be collected and destroyed.

Koidsumi (K.). **Experimental Studies on the Influence of low Temperatures upon the Development of Fruit Flies. 9th Report. On the Acclimatisation to low Temperatures in the Melon Fly Pupae.** [*In Japanese.*]—*J. Soc. trop. Agric.* **9** no. 2 pp. 236–246. Taihoku, Formosa, 1937. **10th Report. Effect of varying low Temperatures upon the Emergence of Larvae and Pupae of** *Chaetodacus ferrugineus* **var.** *dorsalis* **Hendel.**—*T.c.* no. 4 pp. 411–417.

In the first paper are given the results of investigations in Formosa in which pupae of *Dacus* (*Chaetodacus*) *cucurbitae*, Coq., exposed for 2–6 days to a series of temperatures from 15°C. [59°F.] downwards and then transferred to temperatures at or near freezing-point were found to be much more resistant to cold than those exposed to it suddenly. This acclimatisation was more evident in the hot than in the cold season, and was only slightly affected by the durations of exposure to the intermediate temperatures.

The second paper contains an account of further work on *Dacus* (*Chaetodacus*) *dorsalis*, Hend. [*cf. R.A.E.*, A **25** 671] in which young pupae in soil and third-instar larvae in fruits were exposed to low and higher temperatures alternately for periods of 12 hours. Exposures that gave complete mortality of the pupae were: 1 day to −4 and 6–14°C. [24·8 and 42·8–57·2°F.]; 4 days to −2 and 10 or 14°C. [28·4 and 50 or 57·2°F.]; 15 days to 0 and 16°C. [32 and 60·8°F.]; 50 days to 4 and 20°C. [39·2 and 68°F.], or to 6 and 18°C. [42·8 and 64·2°F.]; and 40 days to 8 and 12 or 16°C. [46·4 and 53·6 or 60·8°F.]. Exposures that prevented the larvae from reaching the adult stage or (in brackets) from pupating were 1 (1) day to −4 and 6 or 14°C.; 3 (6) days to −2 and 10°C.; 15 (15) days to 0 and 16°C.; 15 (20) days to 2 [35·6°F.] and 14°C.; 50 (60) days to 4 and 20°C.; 50 (50) days to 6 and 18°C.; and 60 (60) days to 8 and 16°C. No larvae or pupae reached the adult stage at mean temperatures of less than 12°C., but some did so at 13°C. [55·4°F.]. Low temperatures that varied were more lethal than constant low temperatures, and it is the low temperatures that affect the percentage of mortality. *D. dorsalis* is less resistant to varying low temperatures than is *D. cucurbitae.*

WOLFF (N. L.). **Fyrreprocessionsspinderen,** *Thaumetopoea pinivora* **Tr., i Danmark.** [The Pine Processionary, *T. pinivora*, in Denmark.] —*Ent. Medd.* **20** no. 2 pp. 111–120, 1 fig. Copenhagen, 20th April 1938.

Wandering larvae of *Thaumetopoea pinivora*, Treit., all stages of which are described, were observed in the summer of 1937 in a locality on the Danish island of Bornholm, and investigations in October showed that pupae were present in the soil. This is apparently the first record of the species from Danish territory. Notes are given on the distribution of the five European species of the genus and on the habits of *T. pinivora.*

SIMM (K.). **Beitrag zur Kenntnis der Weizenhalmfliege** (*Chlorops pumilionis* **Bj.**). [Contribution to the Knowledge of *C. taeniopus*, Mg.]. [*In Polish.*]—*Roczn. Ochr. Rośl.* **4** no. 4 pp. 9–11. Puławy, 1937. (With a Summary in German.)

Larvae of *Chlorops taeniopus*, Mg. (*pumilionis*, Bjerk.) found early in the spring of 1936 in stems of autumn-sown rye in the south-west of the Province of Krakow had all pupated by 30th March. The first flies appeared on 30th April in the laboratory and on 4th May in the field. This unusually early development [*cf. R.A.E.*, A **24** 745] was probably due to the warm autumn of 1935 followed by a warm spring. An adjoining field of winter wheat, which had been sown rather late in the autumn, towards the end of the flight period of the adults, was little infested. To protect this field from infestation by flies coming from the rye, a trap strip of summer wheat some 40 ins. wide was sown round it on 25th March [*cf. loc. cit.*]. Examination at the time of oviposition of the adults showed that 100 per cent. of the young wheat plants close to the rye were infested, and 20 per cent. of those close to the wheat field. In the wheat field itself, only 10 per cent. of the plants were attacked.

SAALAS (U.). **Ueber den Nahrungsbaum von** *Chrysobothris chrysostigma* **L. (Col., Buprestidae).** [On the Host Tree of *C. chrysostigma.*]—*Ann. ent. fenn.* **4** no. 1 pp. 33–38, 16 refs. Helsingfors, 1938.

Chrysobothris chrysostigma, L., is usually stated to attack deciduous trees, but the author has never obtained it from them in Finland, where it is the only species of the genus. In 1937, he found larval mines of this Buprestid in a fallen spruce trunk, and adults have been observed by himself and others on trunks of pine and spruce.

HENGL (F.). **Zur Prüfung der Schwebefähigkeit von Calciumarsenaten.** [Testing the Suspension Power of Calcium Arsenates.]—*Neuheiten PflSch.* **31** pt. 2 pp. 57–64, 2 graphs, 2 refs. Vienna, April 1938.

In Austria, calcium arsenates have long been used in sprays containing Bordeaux mixture, which tends to keep them in suspension [*cf. R.A.E.*, A **25** 764 ; **26** 252], but if the potato beetle [*Leptinotarsa decemlineata*, Say] should be introduced, it would probably be necessary to apply them without Bordeaux. An account is given of tests of the suspension power in water of the commercial calcium arsenates on the Austrian market, and it is concluded that some of them would be suitable for use.

Sensburg (E.). **Der Kornkäfer und seine Bekämpfung.** [The Grain Weevil and its Control.]—*Der Biologe* **7** pt. 2 pp. 30–45, 6 figs., 1938. (Abstr. in *Neuheiten PflSch.* **31** pt. 3 pp. 78–79. Vienna, April 1938.)

An effective means of destroying *Calandra granaria*, L., in grain heaped up in farm granaries in Germany is the Delitia method of fumigation in which a preparation of hydrogen phosphide (PH_4) in a paper bag, itself enclosed in an outer paper bag, is placed in a heap of grain, which is then covered with a sheet of special paper difficult to ignite. The moisture in the grain releases the gas gradually in a weak concentration. This method is not suitable for grain in ships and silos.

Andersen (K. T.). **Der Kornkäfer** (*Calandra granaria* **L.**) **Biologie und Bekämpfung.** [The Grain Weevil. Biology and Control.]—*Monogr. angew. Ent.* no. 13, 108 pp., 36 figs., 1 pl., 84 refs. Berlin, P. Parey, 1938. Price *M*. 6·50.

This monograph on *Calandra granaria*, L., the chief pest of stored grain in Germany, is divided into four main sections. In the first, all stages are described, and the effect that the various cereals and the size of the cereal grains have on the size of the weevils is discussed. The second and third (pp. 21–66) deal with the biology and physiology of the adult and larva and with the ecology of the insect and variations in its abundance, in which temperature, humidity and food conditions are factors of importance. The various kinds of grain and cereal products infested are noted. In the final section, the signs indicating infestation and differentiating it from infestation by other pests are described and the various measures in use for control are reviewed.

Kemper (H.). **Zur Biologie des Kugelkäfers** (*Gibbium psylloides* **Czemp.**). [Biology of *G. psylloides*.]—*Z. hyg. Zool. SchädlBekämpf.* **30** pt. 4 pp. 97–105, 6 figs., 14 refs. Berlin, 1938.

The author records four cases of infestation by *Gibbium psylloides*, Czemp., in buildings in Germany; it attacked a sponge rubber bath mat, woollen material and towels in dwellings, and leather, paste and tallow in a factory. He also gives an account from the literature and his own observations of the biology of this Ptinid, and concludes that its life-history and habits are very similar to those of *Niptus hololeucus*, Fald. [*R.A.E.*, A **24** 129, etc.] and that measures used against the latter are applicable to it.

Hase (A.). **Zerstörungen von Papierwaren durch Silberfischchen (Lepismatiden) und deren Bekämpfung.** [The Destruction of Paper by Silverfish and their Control.]—*Anz. Schädlingsk.* **14** pt. 4 pp. 37–42, 9 figs., 26 refs. Berlin, 15th April 1938.

The author describes various kinds of injury to documents and other papers by silverfish (*Lepisma*) observed by him in Germany. He found that good quality paper (*i.e.*, that not made of wood pulp) was preferred. For direct control in houses, poison baits containing sodium fluosilicate and sugar or arsenic and syrup should be used. Fumigation is effective against severe infestations.

GERSDORF (E.). **Ueber die Aehnlichkeit der Larven des Kartoffelkäfers mit denen des Lilienhähnchens.** [On the Similarity of the Larvae of *Leptinotarsa decemlineata* and those of *Lilioceris lilii*.]—*Anz. Schädlingsk.* **14** pt. 4 pp. 42–43. Berlin, 15th April 1938.

Larvae that were taken on potato near Hanover in 1936 and 1937, and appeared to be *Leptinotarsa decemlineata*, Say, were reared to the adult stage and proved to be *Lilioceris lilii*, Scop. Morphological differences between the larvae of the two species are compared. Larvae of *Lilioceris* that are about to pupate closely resemble in coloration those of *Leptinotarsa*.

MÜLLER (K. R.). **Der Liebstöckelrüssler, ein gefährlicher Luzerneschädling.** [*Otiorrhynchus ligustici*, a dangerous Pest of Lucerne.] —*Kranke Pflanze* **15** pt. 4 pp. 61–64, 1 pl. Dresden, April 1938.

During the last ten years, *Otiorrhynchus ligustici*, L., has become an increasingly serious pest of lucerne in Germany, being favoured by the extended cultivation of this crop. The migrating adult weevils begin to appear on the first warm days of spring, about the end of March. At the end of April, they oviposit in lucerne and clover fields, laying eggs close to the root stalks, especially of plants sown under cover of barley, and feeding on both lucerne and barley. The larvae attack the roots from the end of May until July in the following year, with a short interruption in winter, and then pupate and transform into adults, but the latter remain at a depth of 12–24 inches in earthen chambers until the following March. More than 90 per cent. of the adults are females and parthenogenetic reproduction occurs, unmated females laying 300–400 eggs. The weevils cannot fly, but can crawl about 500 yards on the ground. The best control is obtained by means of trap trenches [*R.A.E.*, A **25** 640]. Poultry will destroy the migrating weevils, and serious injury to new crops may be prevented by delaying the date of sowing.

BLUNCK (H.). **Ueber die Möglichkeiten zur Bekämpfung der Maikäferengerlinge mittels landwirtschaftlicher Kulturmassnahmen.** [On the Possibilities of combating May Beetle Larvae by agricultural cultural Measures.]—*Z. PflKrankh.* **48** pt. 5 pp. 253–272, 2 graphs, 3 pp. refs. Stuttgart, 1938.

Continuing his survey of measures against *Melolontha* spp. [*cf. R.A.E.*, A **26** 345, etc.], the author reviews the literature on cultural methods against the larvae and concludes that they merit consideration. By adopting a suitable rotation, it is possible to avoid growing highly susceptible crops, such as beet and potatoes, in the second year after the flight year, when injury by the larvae is most severe. Repeated and thorough ploughing is, however, the most effective measure, as it injures the larvae and exposes them to birds. This is best done in spring, but from May to September, after rain, older larvae come sufficiently close to the surface to be reached by the plough. In shallow soil with a high level of subsoil water, the larvae are within reach of deep ploughs even in winter, and this applies in some places to the pupae, which occur from June to August and appear even more sensitive than the larvae to mechanical disturbance. Protracted flooding in summer kills the larvae. No plants are immune from infestation, but it is worth while testing the statement that white mustard and French ray grass (*Arrhenatherum*) are only slightly attacked. Lettuce, beets, carrots, potatoes, beans and strawberries are particularly attractive to the larvae and might be used as traps on small areas.

ZWEIGELT (F.). **Der Kampf gegen Schädlinge und Krankheiten im winterlichen Weingarten.** [Measures against Pests and Diseases in the Vineyard in Winter.]—*Nachr. SchädlBekämpf.* **13** no. 1 pp. 19–35, 8 figs., 43 refs. Leverkusen, March 1938. (With Summaries in English, French and Spanish.)

This is a review of the rôle of winter treatments against pests and fungous diseases of the grape-vine in Europe. The mites, *Phyllocoptes vitis*, Nal., and *Epitrimerus vitis*, Nal., which cause leaf-crinkle [*cf. R.A.E.*, A **18** 385], can be controlled by spraying or brushing the stocks in winter with a preparation of sulphur or 30 per cent. lime-sulphur, while tar-distillate washes are effective against various Coccids and the Capsid, *Lygus spinolae*, Meyer [*cf.* **19** 181], but these two treatments cannot be combined.

SCHMITT (H.). **Ueber Fragen der praktischen Schädlingsbekämpfung im Weinbau.** [Questions of practical Pest Control in Viticulture.] —*Nachr. SchädlBekämpf.* **13** no. 1 pp. 36–42. Leverkusen, March 1938. (With Summaries in English, French and Spanish.)

Infestation by the vine-moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.] was unusually severe in Germany in 1937. The poor grape harvest is attributed to carelessness in combating the spring generation, for severe losses did not occur in vineyards where sprays against it were applied twice, with a brief interval [*cf. R.A.E.*, A **25** 581]. The necessity of thorough spraying is emphasised.

AUFHAMMER (G.). **Wanzenstichige Weizen- und Gerstenkörner.** [Wheat and Barley Grains punctured by Bugs.]—*Prakt. Bl. Pflanzenb.* **15** pt. 12 pp. 333–340, 8 figs., 4 refs. Freising, 1938.

The warm, dry summers of 1934 and 1935 in Germany resulted in an increase of native Pentatomids attacking cereals [*R.A.E.*, A **25** 210 ; **26** 51]. The character of the changes in the grain due to puncture by bugs is described and discussed [*cf.* **23** 119, etc.]. Barley is attacked as well as wheat and its germination power is affected. The injury to barley is not readily visible, but on removal of the glume a brownish discolouration is seen around the puncture. The saliva of the bug liberates enzymes in the grain, which in wheat cause great changes in the colloidal structure of the albumen and affect the flour.

Hanf (M.). **Schadbilder der Blattschneider- oder Tapezierbiene.** [Forms of Injury due to the Leaf-cutting Bee.]—*Kranke Pflanze* **15** pt. 5 pp. 88–90, 1 pl. Dresden, May 1938.

Cases have been observed at Giessen, Germany, of injury to *Robinia pseudacacia*, quince and cherry by leaf-cutting bees, possibly *Megachile centuncularis*, L., which is a well known pest of roses [*R.A.E.*, A **22** 115].

Hilgendorff (G.) & Tomaszewski (W.). **Laboratoriumsversuche über die Regenbeständigkeit von Spritzflecken verschiedener Brühen.** [Laboratory Experiments on the Resistance to Rain of Spot Deposits of various Spray Liquids.]—*NachrBl. dtsch. PflSchDienst* **18** no. 5 pp. 39–42. Berlin, May 1938.

In a number of experiments, spray liquids that had dried on glass plates were sprinkled by the Görnitz " rainfall " apparatus [*R.A.E.*, A **21** 385] to test their resistance to rain. As the coatings with the various liquids differed greatly in quantity, the results, which are tabulated, are not individually comparable.

Commercial calcium arsenates showed great differences in resistance, the residues varying between 6 and 70 per cent. The differences did not occur when calcium arsenates were used with Bordeaux mixture, the residue then being about 60 per cent. Of 9 substances of unstated composition for increasing adhesiveness or resistance to rain, only one increased the resistance of three calcium arsenates of high, medium and low resistance. Soft soap did not increase the resistance of two calcium arsenates of high and medium resistance. Ready-made preparations of calcium arsenate and Bordeaux had only a slight resistance, inferior to that of calcium arsenate mixed with Bordeaux.

Soaps did not notably influence the resistance of Bordeaux mixture or of Bordeaux with calcium arsenate or with Paris green. Calcium arsenate appeared to confer a somewhat increased resistance on Bordeaux, while lead arsenate did not.

The increased resistance of calcium arsenate mixed with Bordeaux is due to the fact that its particles sink in the droplets more rapidly than those of the Bordeaux, so that they are protected by a covering of the latter.

Hampp (H.) & Jehl (J.). **Erdfloh-Bekämpfungsversuche bei Hopfen auf dem Hopfenversuchsgut in Hüll 1937.** [Experiments on the Control of Hop Flea-beetles in 1937 at the Hop Experiment Station at Hüll.]—*NachrBl. dtsch. PflSchDienst* **18** no. 5 p. 42. Berlin, May 1938.

Experiments on the control of flea-beetles attacking hops at Hüll, Bavaria [*R.A.E.*, A **25** 388] were continued in 1937. The over-wintered adults appeared early in May, and the new adults, in smaller numbers, from mid-July onwards. The tests were made with unstated quantities of derris, derris mixed with pyrethrum, and nicotine. As in all previous tests, derris dusts proved absolutely reliable if applied in sufficient quantity ; they are much superior to pyrethrum, nicotine or arsenicals and especially to sprays.

Hampp (H.) & Jehl (J.). **Blattlaus-Bekämpfungsversuche auf dem Hopfenversuchsgut Hüll 1937.** [Experiments in combating Aphids in 1937 at the Hop Experiment Station at Hüll.]—*NachrBl. dtsch. PflSchDienst* **18** no. 5 pp. 43–45. Berlin, May 1938.

In 1937, the first winged Aphids [*Phorodon humuli*, Schr.] were observed on hops at Hüll, Bavaria [*cf. R.A.E.*, A **25** 538] on 25th May, Coccinellids began to prey upon them in numbers about a fortnight later, and Syrphids and other enemies appeared in July. The abundance of the Aphids and of their natural enemies fluctuated considerably according to weather. The hop plants must be carefully watched for infestation, and if only weak plants or the tips of plants are infested it will suffice to restrict spraying to these, care being taken to reach the underside of the leaves. In experiments on control, tests were made with sprays of nicotine, derris and derris with pyrethrum, 14 preparations of unstated composition being tried, and most of the results were excellent. It is recommended that nicotine be used until blossom time, and derris or derris with pyrethrum from then onwards.

Koehler (W.). **Beitrag zur Kenntnis der unter Streudecke der Kiefernbestände überwinternden Schmetterlingspuppen.** [Contribution to the Knowledge of Pupae of Moths that overwinter in the Litter in Pine Stands.] [*In Polish.*]—*Trav. Inst. Rech. For.* (A) no. 29, 81 pp., 5 figs., 11 pls., 14 refs. Warsaw, 1937. (With a Summary in German.) [Recd. May 1938.]

Descriptions are given of the pupae of 57 species of moths that have been found in Poland hibernating in the litter under pine trees. The characters given in them are so arranged that the various species can readily be compared.

Chaboussou (F.). **Contribution à l'étude d'*Ephestia elutella* Hübner.**—*Rev. Zool. agric.* **36** nos. 2, 3, 6, 7, 10, 12 pp. 20–32, 36–48, 81–90, 100–109, 154–158, 184–190 ; 8 figs., 37 refs. Bordeaux, 1937.

This account of the bionomics of *Ephestia elutella*, Hb., and measures for its control is taken partly from the literature and partly from personal investigations in the laboratory and cacao warehouses in Bordeaux. It attacks a large number of manufactured products, of which stored cacao and stored tobacco are the most important. In the first two sections, the morphology and anatomy of the adults and larva, respectively, are described, with notes on the author's method of dissection. In the third, an account is given of the life-cycle, much of which is quoted from the literature [*cf. R.A.E.*, A **18** 427 ; **21** 134]. In the warehouses in Bordeaux, the larvae were most abundant in July–August and the pupae in September ; they are so numerous in some warehouses that hundreds are crushed underfoot, even though the floors are swept several times a day. As the larvae move over the sacks in all directions, they leave silken threads that ultimately form a covering under which hundreds of them pupate. They also climb up the walls and pupate in dark corners near the ceiling. The adults were abundant from the end of June to mid-August (being particularly numerous in July), and again from the end of September to October. The eggs deposited on the outside of sacks of cacao that have been in storage for a year or two are so numerous that they appear like fine gravel.

Parasites are discussed in the fourth section. In the warehouses in Bordeaux, the larvae are attacked by *Microbracon hebetor*, Say, a common parasite of Lepidopterous pests of stored products. The observation that the female feeds at the puncture made by its ovipositor in the host larva was confirmed. The larvae so punctured are paralysed but may live for a month. Eggs were laid on only a small number of the larvae punctured. The egg, larval and pupal stages lasted approximately 3, 8 and 15 days, but the life-cycle varied considerably with the temperature, and, although it occupied 6 weeks in the autumn, it did not take more than 3 at the height of summer. Usually 4–5 larvae occur on one host caterpillar, completely devouring the contents and leaving only the dry skin. The winter is passed in the pupal stage ; the adults disappear in the middle of October and are not seen again before the end of June. The parasite is very abundant in the warehouses in Bordeaux and is obviously of value in control. In view of the equilibrium that has been established for a number of years between it and its host, however, the author does not consider that rearing and releasing it in the warehouses would increase the degree of parasitism. He suggests, however, that the utilisation of *Trichogramma minutum*, Riley, should be considered, as, in his experiments, it readily parasitised eggs of *E. elutella* and completed its life-cycle in 12 days in August at 20–22°C. [68–71·6°F.].

In the fifth section, the economic importance of *E. elutella* is discussed, and in the sixth and last section, the measures that have been advocated for its control are reviewed.

RAUCOURT (M.). **Constitution chimique et action insecticide.**—Cr. 4to, 14 pp. multigraph, illus., 31 refs. Paris, Cent. de Docum. chim. [1937.]

The author reviews a number of investigations dealing with the relation between the chemical composition of a compound and its insecticidal or fungicidal properties, with a view to obtaining information of general application.

The following is taken from his conclusions dealing with insecticides : Among the organic compounds, the normal straight-chain hydrocarbons are always of greater insecticidal value than their isomers. The introduction of an atom of sulphur into the molecule of organic compounds increases their value as contact insecticides and stomach poisons, and the introduction of the NH_2 group increases their value as stomach poisons. The halogens do not augment the insecticidal action of organic substances so generally as they do their toxicity for man. No general conclusions can be obtained from work on insecticidal action in the homologous series. In certain instances, it is possible to relate toxicity to variations in physical properties, such as that expressed by partition coefficients, but these relations do not exist in all cases. It would seem that insecticidal power, at least in organic compounds, is not an intrinsic property of the molecules, and that it may vary with their physical nature. Thus, in the series of aliphatic sulpho-cyanides, the compounds that are most toxic to insects are the higher homologues when they are employed in the liquid state and the lower homologues when they are employed in gaseous form. The study of molecules of particular insecticidal value, such as those of nicotine, rotenone, and their numerous derivatives, gives interesting but fragmentary results. The greater physiological activity of the optically active forms of compounds is demonstrated once again by their greater insecticidal value as compared with that of the racemic forms. In several cases it would appear that the laevo-rotatory form alone is toxic, the dextro-rotatory form being ineffective.

RAUCOURT (M.). **Les traitements insecticides d'été sur pommiers et poiriers.**—*Bull. Congr. pomol. Rouen* October 1936, repr. 9 pp. 3 figs., 5 refs. Rouen, 1937. [Recd. June 1938.]

The question of spraying for the control of *Cydia pomonella*, L., on apple and pear in France is discussed. Diplumbic lead arsenate at present gives the most satisfactory results, but may not be applied on these fruits during the two months preceding the harvesting of the crops [*cf. R.A.E.*, A **26** 259]. Estimates of the arsenic residues on fruit sprayed up to five weeks after flowering, up to two months before harvest, and at even later dates (50–60 days before harvest) showed that, with the exception of a few treatments in which sprays of too great a concentration were applied by inexperienced persons in too large amounts, the residues were not excessive and the averages did not exceed 1 mgm. per kg. fruit.

VIENNOT-BOURGIN (G.). **Sur l'emploi de bandes-pièges dans la lutte contre le carpocapse** (*Laspeyresia pomonella* **L.**].—*Rev. Path. vég.* **25** fasc. 2 pp. 85–93, 1 fig., 1 pl., 6 refs. Paris, 1938.

In experiments on the control of *Cydia* (*Laspeyresia*) *pomonella*, L., in France in 1937, 62 apple trees were banded at different levels in late July with corrugated cardboard impregnated with beta naphthol. Trapped larvae were most numerous in single bands about 5 feet above the ground ; at this level there were maxima and minima of 109 and 35 dead larvae per tree on 10 banded trees, and 158 and 63 cocoons on the controls. If the average at this level is considered as 100, the percentage numbers of larvae taken in bands at other levels were, respectively, 23 at the collar, 37 at the bases of the large branches, and 13 at ground level on trees that had an additional band 5 feet above the ground. Where the two bands were superimposed, however, the total number of larvae trapped was only increased by 3 per cent. It was estimated that the percentage mortality in trapped larvae was 56 on 2nd September, 73 on 1st December and 97 on 8th January. The impregnated bands also killed larvae hibernating on the trunk underneath them, which non-impregnated bands do not. The bands should be removed at the end of January or during February.

WILLAUME (F.). **Deuxième contribution à l'étude de l'action photosensibilisatrice de quelques traitements antiparasitaires. Étude spectrographique dans l'ultra-violet de l'absorption par réflexion de quelques produits fongicides et insecticides.**—*Rev. Path. vég.* **25** fasc. 2 pp. 94–110, 2 pls., 19 refs. Paris, 1938.

This is a study of the light rays absorbed by various insecticides and fungicides, some of which appear to increase the sensitivity of plants to light [*cf. R.A.E.*, A **24** 309].

Bremond (P.). **Sur la biologie de** *Bracon intercessor* **Nees, parasite des** *Lixus* **nuisibles à la betterave au Maroc.**—*Rev. Path. vég.* **25** fasc. 2 pp. 111–118, 1 pl., 1 ref. Paris, 1938.

All stages are briefly described of *Microbracon* (*Bracon*) *intercessor*, Nees, an ectoparasite of the larvae of *Lixus* spp. on beet in Morocco [*R.A.E.*, A **26** 417]. It breeds actively from mid-May until the end of October, and some breeding continues in winter, though many of the pupae pass this period in a state of diapause. The egg, larval and pupal stages last 1–2, 4–5 and 10–11 days, respectively, in June, 1, 3 and 6–7 in September, and 2, 5 and 18 in December. The adults live for about 40 days at all these seasons. Pairing takes place some time after emergence and oviposition begins about 3 days later. The mature female thrusts its ovipositor through the wall of the gallery containing the host larva [*cf. loc. cit.*], deposits an egg on or near it, and then paralyses it. Females are unable to sting larvae that have been extracted from their galleries. In experiments in which 8 *Lixus* larvae in their galleries were supplied daily, one female deposited altogether 140–150 eggs. Another that lived about 40 days laid a maximum of 6 and an average of 4 eggs daily, except at the beginning and the end of its life. Host larvae that are not paralysed destroy the parasite larvae. Pupation takes place in a cocoon at the more recently excavated end of the host gallery. On the Moroccan coast, the rate of parasitism in *Lixus junci*, Boh., is fairly low in June, but rises rapidly to reach 80–85 per cent. at the end of August and the beginning of September ; it falls during September to 25 or 30 per cent. on account of the activity of hyperparasites. An even higher rate of parasitism is found in *L. scabricollis*, Boh., and *L. brevirostris*, Boh.

Bruneteau (J.). **La lutte contre la mouche des cerises** (*Rhagoletis cerasi*) **en Gironde.**—*Rev. Path. vég.* **25** fasc. 2 pp. 173–176. Paris, 1938.

An account is given of experiments on the control of *Rhagoletis cerasi*, L., in the Department of the Gironde, where it causes serious damage to cherries, late varieties sometimes being a total loss. In early May, nearly 3 lb. paradichlorobenzene was scattered in a circular furrow about 3 feet from the trunk of one tree about 13 feet high, which had been infested in previous years, and a month later the fruit was uninfested. Dusting with cryolite or a mixture of barium fluosilicate and talc (1 : 3), and spraying with a bait-spray poisoned with nicotine sulphate gave unsatisfactory results. Infestation was, however, considerably reduced by spraying with a 3 per cent. sugar solution containing 0·5 per cent. ammonium fluoride, and by means of trap-glasses baited with 10 per cent. sugar solution containing 2 per cent. ammonium fluoride. Traps placed in the shade on the north, south and east sides of the trees were more effective than those on the west. In 40 traps kept in operation from 5th to 30th May, 15 females and 1 male were caught in the first 10 days and 510 females and 70 males in the following fortnight.

von Szelényi (G.). **Ueber paläarktische Scelioniden (Hym., Proct.).** [Palaearctic Scelionidae.]—*Ann. hist.-nat. Mus. hung.* **31** (Zool.) pp. 108–128, 16 figs. Budapest, 1938.

A key is given to the females of the palaearctic species of *Inostemma*, with notes on some of the species. New species described include several taken as adults in lucerne fields in Hungary, one of which, *I. contariniae*, was also bred from galls of *Contarinia medicaginis*, Kieff. A new Scelionid belonging to a new genus is described from the galls of a Cynipid on oak in Hungary.

STANILAND (L. N.) & BEAUMONT (A.). **Department of Plant Pathology. Fourteenth Annual Report for the Year ending September 30th, 1937.**—*Pamphl. Seale-Hayne agric. Coll.* no. 48, 48 pp., 3 figs. Newton Abbot, Devon, 1938.

Pests that caused considerable damage in Devon and Cornwall during the year under review, in addition to some already noticed from the two previous reports [*R.A.E.*, A **24** 457; **25** 523], included *Cephus pygmaeus*, L., which was responsible for an almost complete failure of wheat in south Devon; *Aphis rumicis*, L., on beans, beet and mangels; and *Kakothrips pisivorus*, Westw. (*Frankliniella robusta*, Uzel) on peas. Applications of derris dust destroyed many weevils (*Apion* spp.) on clover, and the amount of seed harvested was much increased; further trials are to be carried out. Aphids were particularly numerous, and *Aphis pomi*, DeG., *Anuraphis roseus*, Baker, and *Eriosoma lanigerum*, Hsm., caused serious damage to apple. A survey, which is to be continued, was carried out on the abundance and distribution of *Myzus persicae*, Sulz., on potato. There appear to be many districts in Devon and Cornwall in which the Aphid population is too low to be of importance in the transmission of virus diseases [*cf.* **25** 389], and which will probably be suitable for seed potato production. Other Aphids on potato were *Macrosiphum solanifolii*, Ashm. (*gei*, auct.), *Aphis rumicis*, *A. rhamni*, Boy., *Macrosiphum solani*, Kalt. (*Myzus pseudosolani*, Theo.), and *Myzus ornatus*, Laing, which was recorded on this plant for the first time.

Insects not recorded in the last 12 years, and those occurring on food-plants not previously recorded, included *Anthophila pariana*, Cl., on apple, and *Chermes* (*Adelges*) *piceae*, Ratz., on silver fir [*Abies* sp.], both in Devon, and *Cnephasia conspersana*, Dougl., which was bred from larvae feeding on the flowers of iris in the Scilly Isles.

MENOZZI (C.). **Osservazioni sugli insetti dannosi alla barbabietola e lotta contro di essi durante la campagna saccarifera 1937.** [Observations on Insect Pests of Sugar-beet and their Control during the Sugar-beet Season in 1937.]—*Industr. saccar. ital.* **31** no. 3 repr. 8 pp. Genoa, March 1938.

In 1937, sugar-beet developed normally in Italy at the beginning of the season, but the first damage by insects did not occur until early in May. *Cleonus mendicus*, Gyll., caused more or less serious injury in some districts, but was effectively controlled in one by *Rondania cucullata*, R.-D. (which is the Tachinid previously misidentified as *R. dimidiata*, Mg. [*R.A.E.*, A **19** 461; **24** 361, etc.]), while in another, hand collection and spraying with barium chloride proved successful. *C. luigionii*, Sol., was associated with *C. mendicus* in one case. In Central Italy, larvae of *C. mendicus* were parasitised by the Tachinid, *Zeuxia cinerea*, Mg.; its biology appears to be unknown. One or other of the Cassidids, *Cassida vittata*, Vill., *C. nobilis*, L., and *C. nebulosa*, L., occurred in several districts. *C. vittata* completely destroyed about 370 acres of beet in Ravenna, where rain and lack of organisation hampered control, and breeding of the parasites, *Tetrastichus bruzzonis*, Masi, and *Brachymeria vitripennis*, Först., for release was delayed for lack of material. *Hypocassida subferruginea*, Schr., *Cassida murraea*, L., *C. deflorata*, Suffr., *C. rubiginosa*, Müll., *C. vibex*, L., *C. viridis*, L., and *C. algirica*, Luc., were examined for parasites, and *B. vitripennis* was found to parasitise all except the first, and *T. bruzzonis* all except the first two. Two Eulophids were obtained, *Eulophus* sp. from *C. deflorata* and *C. rubripennis*, and *Pleurotropis* sp. from *C. viridis* and *C. nebulosa*, and both readily parasitised the larvae of *C. vittata* and *C. nobilis*. A Trichogrammatid, *Centrobia* sp., was obtained from the eggs of *C. murraea*, *C. viridis* and *C. nebulosa*, but did not parasitise those of *C. vittata* and *C. nobilis*, probably because they are isolated. Comparatively little harm was done by *Lixus junci*, Boh., and *L. scabricollis*, Boh. The former has a number of parasites [**23** 161], but only *Microbracon intercessor*, Nees, *Hockeria unicolor*, Wlk., and *Systole* sp. attack the larvae of the latter. Up to 45 per cent. of the eggs of *L. scabricollis* and 5–8 per cent. of those of *L. junci* are parasitised by *Habrocytus lixi*, Sarra. *Chaetocnema tibialis*, Ill., did no serious harm on the whole. A sudden infestation by *Euxoa segetum*, Schiff., and *Polia oleracea*, L., occurred on beet in Central Italy, about 150 acres being affected. Larvae of *E. segetum* were parasitised by *Amicroplus collaris*, Spin., *Tachina* (*Eutachina*) *larvarum*, L., and *Villa* (*Anthrax*) *hottentotus*, L., and those of *P. oleracea* by *Brachymeria intermedia*, Nees, *Voria ruralis*, Fall., and *Pales pavida*, Mg. In one district, more or less important injury was caused by *Gryllulus* (*Gryllus*) *desertus*, Pall., and [*Gryllotalpa gryllotalpa*, L.], against which baits of rice poisoned with zinc phosphide or barium fluosilicate were used.

Sugar sorghum [broom corn] was everywhere infested by *Pyrausta nubilalis*, Hb., and often by *Sesamia cretica*, Led., and by Aphids.

ROSENTHAL (H.). **Azione delle temperature elevate sui vari stadi di sviluppo di** *Dermestes vulpinus* **F.** [The Action of high Temperatures on the various developmental Stages of *D. vulpinus*.]—*Bol. Zool.* **9** pt. 1–2 pp. 37–39. Turin, 1938.

Exposure at about 70 per cent. humidity to 45°C. [113°F.] produced 50 per cent. mortality in eggs, larvae, pupae and adults of *Dermestes vulpinus*, F., in 3, 0·75, 4 and 3 hours, respectively. Of larvae in various stages of development exposed for 3 or 4 hours to 41°C. [105·8°F.], the majority survived ; some pupated and gave rise to adults, while others were able to move quickly and feed, but died after a few days.

SCHEDL (K. E.). **Scolytidae und Platypodidae. 48. Beitrag. Die Gattungen** *Coccotrypes* **Eichh.,** *Poecilips* **Schauf.,** *Thamnurgides* **Hopk. und** *Dendrurgus* **Egg. nebst Beschreibung einer neuen Art.** [Scolytids and Platypids. 48th Contribution. The Genera *Coccotrypes*, *Poecilips*, *Thamnurgides* and *Dendrurgus* with the Description of a new Species.]—*Ent. Ber.* **10** no. 219 pp. 8–12, 2 figs. Amsterdam, 1st January 1938.

The author considers that the genera *Dendrurgus* and *Thamnurgides* are synonyms of *Poecilips*, and gives a key distinguishing the latter from the closely allied genus *Coccotrypes*, with lists of the species that he considers referable to each. He also describes *Poecilips nuciferus*, sp. n., infesting butter-nuts (*Caryocar nuciferum*) received at Amsterdam from Dutch Guiana.

Diakonoff (A.). **Insecten in Sawarie-noten.** [Insects in Butter-nuts.] —*Ent. Ber.* **10** no. 219 pp. 12–14. Amsterdam, 1st January 1938.

Kernels of butter-nuts (*Caryocar nuciferum*) received at Amsterdam from Dutch Guiana in 1936 and 1937 were found to be infested with *Tribolium castaneum*, Hbst. (*ferrugineum*, F.), *Poecilips nuciferus*, Schedl [see preceding paper], *Neodryocoetes* sp., *Plodia interpunctella*, Hb., *Ephestia cautella*, Wlk., and dead adults of *Lophocateres pusillus*, Klug.

Polak [R. A.]. [*Malacosoma neustria*, **L., in Amsterdam.**]—*Tijdschr. Ent.* **81** pt. 1–2 pp. xvii–xxi. Amsterdam, May 1938.

At a meeting of the Netherlands Entomological Society, the author criticised the use of a derris dust against larvae of *Malacosoma neustria*, L., attacking trees in Amsterdam. He considers that the larvae would be shielded by their webs against the dust, that many harmless species would be destroyed, and that control would best be obtained by means of Hymenopterous parasites. In the ensuing discussion [A.] Diakonoff replied that derris greatly reduced the ultimate number of pupae and adults. Only 1–2 per cent. of the larvae were parasitised, the parasites concerned being Tachinids.

Polak (R. A.). **De Amsterdamsche Rupsenplaag.** [The Caterpillar Plague in Amsterdam.]—*Ent. Ber.* **10** no. 221 pp. 33–36. Amsterdam, 1st May 1938.

This is a reply to various points raised in the discussion of the author's view that it would be better to rely on parasites than to dust with derris for the control of *Malacosoma neustria*, L., in Amsterdam [see preceding abstract]. He states that in 1910, a very large percentage of the larvae were parasitised by 10–12 species of Hymenoptera. The possible poisonous effect of derris on man and on the fish in the city canals requires investigation.

Parasiti českých motýlů. [Parasites of Czechoslovakian Moths.]—*Acta Soc. ent. Čsl.* **35** no. 1–2 p. 62. Prague, 1938.

In January 1935, the Tachinid, *Zenillia* (*Carcelia*) *susurrans*, Rond., was bred in Czechoslovakia from the overwintered larvae of *Dioryctria abietella*, Schiff. It has not previously been recorded as a parasite of this Pyralid. *Sturmia scutellata*, R.-D. has been bred from the Sphingid, *Celerio* (*Deilephila*) *euphorbiae*, L.

[Ugarov (A. A.) & Nikol'skiĭ (V. V.).] **Угаров (А. А.) и Никольский (В. В.). Zur Klassifikation der mittelasiatischen Spinnmilbe.** [Contribution to the Classification of the Central Asiatic Spider Mite.] [*In Russian.*]—*Trud. vsesoyuzn. Inst. Zashch. Rast. Sredneaz. Sta.* no. 2 (*Voprosui Zashch. Khlopkh.* [Prot. Cotton]) pp. 26–64, 34 figs., 13 refs. Tashkent, Izd. Komit. Nauk UzSSR, 1937. (With a Summary in German.)

[Ugarov (A. A.).] **Угаров (А. А.). The Middle Asia** *Tetranychus.* [*In Russian.*]—*Social. Sci. Tech.* **5** no. 9 pp. 26–40, 36 figs. Tashkent, 1937. (With a Summary in English.)

The first paper is an account of work in 1935, a summary of which has already been noticed [*R.A.E.*, A **26** 470]; it was undertaken in view of the confusion that exists with regard to the identity of the Tetranychid mite that is a pest of cotton in Central Asia [*cf.* **25** 311, etc.]. Examination was made of 6,000 mites taken from 36 species of plants collected near Tashkent and in 11 districts in Turkmenistan, Uzbekistan, Tadzhikistan and western Kirghizia. None of the species recorded in the literature as occurring in Central Asia was found among the mites taken; they belonged to six new species, which are described, with a key, a new genus being erected for two of them. They comprise *Tetranychus* (*Eotetranychus*) *turkestani*, which was the commonest and the only one definitely found to infest cotton; *T.* (*E.*) *scabrisetus*, on elm; *T.* (*Apotetranychus*) *longipenis*, on apple; *Paratetranychus* (*Eurytetranychus*) *stenoperitrematus*, which was found on various plants including maize and water melons and was observed on cotton in a single instance, its occurrence on it being apparently accidental; *Peritetranychus* (gen. n.) *tuberculatus*, of which only females were taken, on mulberry; and *P. glabrisetus*, of which one individual was found, on watermelon. A table is appended showing the plants on which the various species of mites were taken, and the dates and places of collection.

The second paper contains a briefer account of these investigations and additional information based on work in 1936, in the course of which about 2,000 more mites were examined, the number of food-plants was increased to 50, another new species, *Tetranychus* (*Apotetranychus*) *virginis*, which is described, was taken on pear, sunflower, peach, cherry and plum, and gooseberry, currant and walnut were found to be additional food-plants of *T. scabrisetus*. It is concluded that *T. turkestani*, which is extremely polyphagous, is the only Tetranychid attacking cotton in Central Asia.

Neu (W.). **Funde von** *Hylotrupes bajulus* **L. (Hausbock) in Istanbul.** [Records of *H. bajulus* in Istanbul.]—*Festschr. 60. Geburtst. Strand* **4** pp. 500–502. Riga, 28th May 1938.

Four adults of *Hylotrupes bajulus*, L., were found in a dwelling house in Istanbul in 1936 and eight others in the same room in 1937; of these twelve, seven were females. Infestation by *H. bajulus* has also been observed in new timber in a new building in the city, and a larva was found boring in a microscope slide box in the Zoological Institute.

Portères (R.) & Legleu (R.). **La « rosette » de l'arachide. Connaissances actuelles. Relations avec la date des semis dans le pays du Baoulé-Nord. Méthodes prophylactiques à appliquer.**—*Ann. agric. Afr. occ.* **1** no. 3–4 pp. 332–355, 1 map, 21 refs. Paris, 1937. [Recd. 1938.]

Records are given of the distribution of rosette disease of ground nuts [*Arachis hypogaea*] in the west of the French Sudan, of the percentage infection in two varieties sown at different times in various localities, of the loss in crop weight due to infection, and of the effect of soil types on it. The different strains of the disease are discussed. Characters are given for the identification of the vector, *Aphis laburni*, Kalt., and of the Coccinellids, *Cydonia lunata*, F., *C. vicina*, Muls., and *Exochomus flavipes*, Thnb., which are predacious on it.

In a discussion of methods of control, it is suggested that sowing in any one district should be restricted to as short a period as possible during the two months that follow the first rains and that cultural measures should be adopted to hasten the maturity of the plants. From germination until flowering, the fields should be examined once a week, and the infected plants and Aphids on them destroyed by the following method. A square of muslin, about 28 ins. wide, with a cord attached to one corner, is placed over each diseased plant, and the plant is then gently uprooted, the muslin tied round its base, and the whole placed in a metal cylinder. The plants are taken from the fields and unwrapped over a basin containing oil emulsion into which the earth and Aphids fall and into which the muslin is immersed for one minute. The plants are burnt. It is not economic to destroy plants between flowering and harvest.

A Guide to the Insects of *Dalbergia sissoo* **for Forest Officers.**—*Indian For. Rec.* (N.S.) Ent. **4** no. 1, [4] + 42 pp., 2 figs. Delhi, 23rd April 1938. Price 1*s*. 9*d*.

Information on insect pests of forest trees in India is scattered through a number of publications and correspondence files and there is no index or means of ready reference to it. For this reason, a series of guides is being prepared in which the results of research on pests of 30 of the more important forest trees will be summarised and references to the published records given.

This guide to the pests of shisham, *Dalbergia sissoo*, deals with 44 insects attacking the living tree and 28 Coleoptera attacking the felled tree and timber. They are arranged according to the types of injury they cause, and notes are given on such points as their morphology, distribution, seasonal history, bionomics, alternative food-plants and natural enemies, and, in cases where they are of sufficient economic importance, on the measures recommended for their control. Brief instructions for packing insects that are to be sent for identification are appended.

Cherian (M. C.) & Kylasam (M. S.). **Preliminary Studies on the "Freckled Yellow" and "Stripe" Diseases of Cholam.**—*Proc. Ass. econ. Biol. Coimbatore* 1936 repr. 7 pp., 1 pl. Coimbatore, 1936. [Recd. June 1938.]

An account is given of the symptoms of the freckled yellow and stripe diseases of *Sorghum* in Madras, and the nature and extent of the loss of the crop in 1935–36 are discussed. The former disease caused higher mortality in plants infected in the initial stages of growth, and reduced the production of earheads by nearly 50 per cent. In experiments, both adults and nymphs of *Peregrinus maidis*, Ashm., transmitted freckled yellow from diseased to healthy plants but not stripe [*cf. R.A.E.*, A **26** 55]; the symptoms appeared 4–15 days after infection. Neither disease was transmitted by *Aphis maidis*, Fitch, or *A. sacchari*, Zehnt., or by juice inoculation. That the stripe disease was due to a virus was evident from the fact that it did not appear in plants heavily infested by adults and nymphs of *Peregrinus* that had not fed on diseased plants, whereas it always appeared in tillers growing from the base of infected plants. *P. maidis* has also been found breeding in ragi [*Eleusine coracana*], cumbu [*Pennisetum typhoideum*] and maize, showing similar symptoms.

Haroon Khan (M.). **Studies on** *Platyedra gossypiella* **Saunders (the Pink Bollworm of Cotton) in the Punjab. Part IV. The Incidence of** *Platyedra gossypiella* **in relation to Climate (1926–1931).**—*Indian J. agric. Sci.* **8** pt. 2 pp. 191–214, 2 graphs, 1 map, 25 refs. Delhi, April 1938.

Details are given of investigations in the Punjab in 1926–31 on the correlation of climate and the distribution and incidence of *Platyedra gossypiella*, Saund., on cotton, the chief results of which have been already noticed [*R.A.E.*, A **24** 763]. Counts of green bolls from 12 stations showed that attack began directly the green bolls were available and increased throughout the season; the intensity varied from year to year, even within the same locality. Incidence chiefly depended on climatic factors, females emerging from pupae exposed to temperatures below 75°F. or above 82°F. laying few eggs. During most of the day, the temperature does not fall within a suitable range anywhere in the Punjab.

On the basis of the normal incidence of *P. gossypiella*, the province is divided broadly into 4 zones having varying climatic conditions, of which the index was taken to be rainfall; areas where over 15 per cent. and 1 per cent. or less, of the green bolls were attacked were situated east of the 15 in., and west of the 8 in., isohyet, respectively. In districts where attack is heavy, the climate is mild and humid and thus favours the multiplication of the moth, but hot and dry conditions prevail in districts where attack is light.

Narayanan (E. S.). **A Note on** *Stenobracon deesae* **(Cam.), a new Parasite of the Root-borer of Sugarcane.**—*Indian J. agric. Sci.* **8** pt. 2 pp. 215–216, 1 pl., 4 refs. Delhi, April 1938.

Glyptomorpha (*Stenobracon*) *deesae*, Cam., was reared from larvae of the sugar-cane root borer, *Emmalocera depressella*, Swinh., at Pusa in 1935 [*cf. R.A.E.*, A **25** 349] and 1936; it had not previously been recorded from this host. The percentage of parasitism observed in the sugar-cane fields, where the adults were seen in small numbers from the last week in April to the beginning of July, varied from 3 to 5. The larval period in the host lasted 22–25 days, and the pupal period 10 days during the monsoon months. Adult females died in 36 hours if unfed, but lived for 7–10 days in glass rearing jars if fed on sugar solution. Males died within 36 hours even if fed.

Memoria de la Estación experimental agrícola de La Molina correspondiente al año 1935. [Report of the La Molina agricultural Experiment Station for 1935.]—*Mem. Estac. exp. agric. Minist. Fom. Peru* no. 8, 388 pp., illus. Lima, January 1936 [1937].

This report includes sections by J. Wille (pp. 187–238) and other authors (pp. 337–381) dealing with surveys of pests in Peru and tests of insecticides. Most of the pests have already been noticed [*R.A.E.*, A **24** 330, 571 ; **25** 113]. *Dysdercus mimus*, Say, was found on *Sida paniculata*, *Malachra* sp., and also, to a slight extent, on cotton, on which it produces the same type of injury as *D. ruficollis*, L. Several observations of the infestation of the roots, and one of the stem, of *Malachra* sp. by *Gasterocercodes gossypii*, Pierce, were made, and this plant must be regarded as a source of danger to cotton. The chief insecticide tested was a locally prepared pyrethrum fluid ; it was effective as a spray against the cotton pests, *Anomis luridula*, Gn. (*texana*, Riley) and *D. ruficollis*.

Roba (R. P.). **Notes sur quelques insectes s'attaquant au caféier en Colombie.**—*Bull. Ann. Soc. ent. Belg.* **78** pt. 4 pp. 235–239. Brussels, 28th April 1938.

Very brief records are given of 33 insects observed on coffee (*Coffea arabica*) in Colombia. They are of little or no economic importance, in most cases because of the abundance of natural enemies.

Kintzel (W.). **Beiträge zur Bekämpfung der Blattschneiderameisen in Brasilien.** [Contributions to the Control of the Leaf-cutting Ants in Brazil.]—*Tropenpflanzer* **41** nos. 3–4 pp. 93–120, 158–166, 2 figs., 10 refs. Berlin, March–April 1938.

Leaf-cutting ants are among the most serious pests of cultivated plants in South America. In Brazil, the chief species are *Atta sexdens*, L., *Acromyrmex* (*Atta*) *striatus*, Rog., and *Acromyrmex* (*Atta*) *niger*, Sm., especially the first. Their numbers have increased with the extension of agriculture, for the clearing of the forests has destroyed their natural enemies. A general survey is given of their biology, and the structure of the nests is described [*cf. R.A.E.*, A **23** 750]. A large hollow space above the main nest often renders fumigation ineffective because its comparatively low temperature condenses the gases pumped in. The author gives an account of laboratory and field experiments in São Paulo, using fumigants recognised by the state authorities. The great differences in the character of the nests made the results very variable, but preparations containing carbon bisulphide proved more effective than those containing arsenic or mixtures of arsenic and sulphur, while those containing sodium cyanide were unreliable even against recently established nests.

Pickles (A.). **Insecticides for the Control of certain Trinidad Crop Pests.**—*Trop. Agriculture* **15** no. 6 pp. 126–131, 3 figs., 1 ref. Trinidad, June 1938.

The use of chemicals for the control of insect pests in Trinidad is discussed, and an account is given of the preparation of a selected number of stomach poisons, contact insecticides and repellents (most of which have been tested and proved useful under local conditions) with indications of the types of insects against which each may be used, especial attention being paid to those that can be prepared on the spot from ingredients readily obtainable.

Brown (A. W. A.). **The Forest Insect Survey.**—*Rep. ent. Soc. Ont.* **68** (1937) pp. 13–18, 1 map, 1 ref. Toronto, 1938.

The forest insect survey, which is carried out on a co-operative basis with government organisations and private companies, is a project that has grown rapidly of recent years, its ultimate aim being to cover the whole of Canada. The numbers of samples of insects (sawflies and moths) that defoliate conifers received for rearing in insectaries were 512 in 1936 and over 3,000 in 1937. The object of this paper is to indicate the kind of data obtained on them. A table records 7 sawflies and 10 moths from conifers and 2 moths from other trees, and shows the food-plants of each, the number of specimens received, sex ratio, percentage survival of larvae and pupae, percentage parasitism and number of species of parasites. The distribution of infestation by 7 of the more important pests is indicated on a map, and some additional notes on biology are given.

Cocoons of the spruce sawfly, *Diprion polytomum*, Htg., from the Gaspé showed an emergence of 20 per cent. in the spring following collection in 1936, as compared with 58 per cent. for those from the remainder of Quebec and from Ontario, where the prolonged diapause in the cocoon characteristic of the Gaspé appeared to be lacking, and where the occurrence of a partial second generation was generally indicated. In the insectary, adults emerged from 8th July to 12th October, a total of 15 per cent. of the cocoons (except those from the Gaspé) showing summer emergence. Parasitism was negligible in 1936. Only 0·7 per cent. of the sawflies that emerged were males.

Patterson (N. A.). **Experiments in the Control of Green Apple Bug, Apple Redbug, and the Pale Apple Leafhopper by means of Pyrethrum Dusts and Sprays.**—*Rep. ent. Soc. Ont.* **68** (1937) pp. 18–19. Toronto, 1938.

Field experiments in the south-west of Nova Scotia in 1936 and 1937 showed the effectiveness of pyrethrum dusts and sprays against *Lygus communis*, Knight, *Lygidea mendax*, Reut., and *Typhlocyba pomaria*, McAtee, in apple orchards. The pyrethrum, which was finely powdered, contained 0·94 and 0·89 per cent. total pyrethrins in 1936 and 1937, respectively ; the dust consisted of pyrethrum and dusting gypsum (3 : 7).

The adults of *Lygus communis* are little affected by nicotine, but were almost completely controlled by pyrethrum dust in 1936. In 1937, the percentage control of nymphs was 98·8 with pyrethrum dust, 98·7 with a 2 per cent. nicotine dust, and apparently 100 per cent. in another orchard with pyrethrum dust applied from one side of the tree only. Nymphs were controlled satisfactorily by a spray containing 3 lb. pyrethrum per 100 gals. when it was mixed with water only, but not when it was used with a mixture of the iron sulphate and lime-sulphur. Good control of nymphs of *Lygidea mendax* was obtained with pyrethrum dust ; and both dusts and sprays were effective against *Typhlocyba pomaria*.

GILLIATT (F. C.). **Some Records of Captures in Orchard Light Traps.**—*Rep. ent. Soc. Ont.* **68** (1937) pp. 19–24. Toronto, 1938.

Records are given of 55 species of Lepidoptera caught in 4 light-traps (with 60-watt electric bulbs) that were kept in operation from May to November in 1936 and 1937 in an orchard in Nova Scotia. They show the numbers of each sex taken, the earliest and latest dates of capture and, for the more abundant species, the dates of maximum emergence. The traps had first been set up in 1935 to test their possible value for the control of *Eulia mariana*, Fern., but only 19 females of this moth were caught during the three seasons, though over 1,000 males were taken. For most of the other species also, the records show a predominance of males over females. It appeared, however, that the traps may be used to forecast outbreaks of insect pests, to identify insects rare or previously unknown in the district, to show the maxima for different generations when more than one occurs during a season, and possibly to establish cyclic fluctuations in the abundance of pests over a period of years.

VAN STEENBURGH (W. E.) & BOYCE (H. R.). **The simultaneous Propagation of** *Macrocentrus ancylivorus* **Rohwer and** *Ascogaster carpocapsae* **Vier. on the Peach Moth** (*Laspeyresia molesta* **Busck**) **: a Study in multiple Parasitism.**—*Rep. ent. Soc. Ont.* **68** (1937) pp. 24–26. Toronto, 1938.

Macrocentrus ancylivorus, Rohw., was introduced into Ontario for the control of *Cydia* (*Laspeyresia*) *molesta*, Busck, on peach [*R.A.E.*, A **18** 494], and since 1931 releases have been continued with laboratory-reared parasites. The propagation of *Ascogaster carpocapsae*, Vier., which parasitises both *C. molesta* and *C.* (*Carpocapsa*) *pomonella*, L., was undertaken in 1932 to provide parasites for release against the latter on apple in British Columbia [**25** 189].

Ascogaster oviposits in the eggs of the host [**20** 466] and *Macrocentrus* in the larvae [**20** 405] but the larvae of both remain in the first instar until the host larvae are mature. For rearing *Macrocentrus*, eggs of *C. molesta* are placed, just before hatching, on lightly scored apples. After the larvae have fed for 10–15 hours (or for 2–5 days if sliced green apples are used), the apples are hung for 24 hours in a cage containing females of *Macrocentrus*, and then returned to incubation. For the propagation of *Ascogaster*, eggs of *C. molesta* of 2 days development are placed with the females for a short time, and then on green apples as above. In the laboratory, a higher parasitism percentage can be secured by *Ascogaster*, to which the eggs of the host can be completely exposed, than by *Macrocentrus*, because the manner of feeding of the host larvae makes only a varying proportion available to it.

In studying the simultaneous propagation of the parasites in Ontario in 1936–37, it was found that first-instar larvae of *Macrocentrus* always destroyed those of *Ascogaster* in the same host. For rearing the two parasites in a single process, eggs of *C. molesta* that had been thoroughly worked over by females of *Ascogaster* were placed on scored or sliced apples, and *Macrocentrus* was then reared as usual. The age of the *Ascogaster* larvae when *Macrocentrus* parasitism occurred did not appear to influence the ability of larvae of the latter to survive. The percentage of host larvae from which *Macrocentrus* was obtained was as high as when it was reared separately. The numbers of *Ascogaster* surviving were considerably reduced, but a given amount of host material was better utilised if both parasites were reared together.

THOMPSON (R. W.). **Notes on Corn Borer Resistance in hybrid Corn.**—*Rep. ent. Soc. Ont.* **68** (1937) pp. 28–32, 5 charts, 2 refs. Toronto, 1938.

The resistance to the European corn borer [*Pyrausta nubilalis*, Hb.] of 40 hybrid strains of maize, including some from the United States, and 9 standard varieties in common use throughout Ontario was tested at each of 3 stations in the extreme south of Ontario in 1937. The average borer populations of the varieties and such strains as were found suitable for cultivation in the province are shown on charts ; those of the Wisconsin hybrids were consistently lower than those of the standard varieties, and one or two hybrids gave the lowest populations recorded at each station. The hybrids showed a lower percentage of broken stalks, probably owing to greater toughness, and the leaves were well spaced throughout the length of the stems. They compared favourably with the best-yielding standard varieties, and the Wisconsin strains produced well filled cobs of good quality, although not very large.

The infestation of maize by *P. nubilalis* in 1937 increased in most of the counties west of Ontario county, largely owing to wet weather in the spring, which prevented a satisfactory clean-up, and an abundance of moisture during the period of moth flight, oviposition and larval establishment. To the east of Ontario county, where these conditions were not prevalent, the infestation showed a general decrease.

MAXWELL (C. W. B.) & LORD (F. T.). **A Laboratory Technique for the Comparison of contact Insecticides, using *Drosophila* Flies.**—*Rep. ent. Soc. Ont.* **68** (1937) pp. 33–36, 1 fig. Toronto, 1938.

Notes are given on the use of *Drosophila melanogaster*, Mg., as a test insect for comparing contact spray insecticides, including the rearing and preparation of the flies for spraying, the spraying operations and care of the flies afterwards. The spraying apparatus is described and illustrated, the atomiser being Tattersfield's no. 2 type [*cf. R.A.E.*, A **23** 82]. A table giving the percentages of mortality obtained in comparing various brands of nicotine with or without soap shows that the results were consistent when batches of 2,000 or more flies from apparently normal cultures were used. Other experiments have indicated that the condition of flies is very important for consistent results and that large numbers must be used to overcome differences in apparently normal cultures.

DUSTAN (G. G.). **Some Results in Controlling the Onion Maggot (*Hylemyia antiqua* Meig.) with Calomel.**—*Rep. ent. Soc. Ont.* **68** (1937) pp. 37–43, 1 fig., 4 refs. Toronto, 1938.

In 1935–37, the effectiveness of mercurous chloride (calomel) against *Hylemyia antiqua*, Mg., on onions, was tested in the Niagara district of Ontario [*cf. R.A.E.*, A **25** 784]. It gave better results when used for seed treatment than when applied to the young plants as a dilute dust or a suspension in water. The seed is well moistened, the surplus moisture shaken off, and, while it is still moist, a weight of mercurous chloride 1–1½ times that of the seed when dry is sprinkled over it and the two are evenly mixed. The seed should be sown at once, because if it is allowed to dry the mercurous chloride will tend to flake off.

In 1935, tests were made with pickling onions sown at the rate of 40 and 80 lb. seed per acre. The percentages of injured plants were 0·16 for onion seed treated with an equal weight of mercurous chloride, 0 for a mixture of equal parts of onion seed and dead lucerne seed similarly treated, 3·09 for seed dusted in the furrow with gypsum containing 4 per cent. mercurous chloride, and 12·9 for untreated controls.

In 1936, the seed of pickling onions was treated with an equal weight of mercurous chloride, but sown at 80 lb. per acre as it only tested 50 per cent. germination. Counts made on 9th and 18th June showed an average injury of 0 and 0·06 per cent., respectively, as compared with 6·3 and 7·8 per cent. in the controls. At harvest time, the treated and control plots yielded 7,076 and 5,377 lb. per acre, respectively.

In 1937, pickling onions sown at 50–60 lb. per acre showed 23·5 per cent. injury on 25th June, when untreated, but none at all when the seed was treated with one-fourth of its weight of mercurous chloride, with enough dry gypsum to absorb the surplus moisture and allow the seed to run freely. Other tests showed that treatments with 1 or 2 parts mercurous chloride to 1 part seed were more effective than spraying with lubricating oil emulsion in Bordeaux mixture, while the latter was more effective than applying 1 oz. mercury bichloride (corrosive sublimate) in 10 gals. water with a watering can. In a large scale experiment, the percentages of injury were 5·7 and 7·6 for plants from seed treated with 1½ and 1¼ parts mercurous chloride ; 11·2 for those sprayed twice with 2 per cent. lubricating oil emulsion in 2–4–40 Bordeaux ; and 22·1 for untreated plants, and the yields for the first two and the last were 7·3, 11·0 and 4·0 tons per acre. The onions from seed-treated plots were much smaller than those from the untreated plots.

The seed treatment is cheaper than oil spraying for field onions sown at 4–6 lb. seed per acre. It is too expensive for pickling onions, if an equal weight of mercurous chloride is used, but it appeared that one-fourth of this, with enough of some dry inert substance such as gypsum to absorb the surplus moisture, will give fair control. Preliminary tests were made with adhesives to prevent the mercurous chloride from flaking off [*cf.* **25** 14] ; seed soaked in a solution of sugar (6 oz. per qt. water) took up more mercurous chloride and retained it much more firmly after drying.

McLeod (J. H.). **Further Notes on Parasites of Aphids.**—*Rep. ent. Soc. Ont.* **68** (1937) pp. 44–48, 3 refs. Toronto, 1938.

Records are given of some natural enemies of Aphids observed in the Belleville area (south-western Ontario) in the summer of 1937, together with an account of parasitism of *Myzus persicae*, Sulz., on tobacco and tomato in a greenhouse in the winter of 1936–37. The parasites occurring naturally in the greenhouse were the Braconids, *Aphidius phorodontis*, Ashm. [*cf. R.A.E.*, A **25** 784], and *Ephedrus nitidus*, Gah. ; in addition, *Aphelinus jucundus*, Gah., and *A. marlatti*, Ashm., which had been reared from unidentified Aphids, were introduced into it. All four parasites persisted throughout the winter in spite of a very low host population, and the fact that the Aphelinids were breeding on a host on which neither appeared to be normally parasitic. *E. nitidus*, of which this is the first record in Canada, but which was found in numbers during the summer of 1937 breeding on an Aphid on wild aster, preferred the more exposed parts of the plant, in contrast to *Aphidius*. An Aphid killed by the former was black with a longitudinal white strip of silk along the ventral surface, where the parasite had attached it to the substratum before pupating in it.

The bionomics of *Aphelinus marlatti* were studied in the laboratory. Reproduction was parthenogenetic and no males were observed. Usually only 1 egg was laid in the Aphid, and the egg stage lasted about 65 hours at 70°F. The Aphid was fastened to the substratum, just before the parasite larva pupated, by the exudation of a quickly hardening liquid. The adult emerged through a hole in the dorsal surface of the host, and often oviposited a few hours later. For a short time after parasitism, the Aphid appeared to be paralysed and was not disturbed when, as frequently happened, the parasite fed at the oviposition hole. Young Aphids were killed by the feeding of the adult parasite, and in many cases it was observed to puncture and feed without ovipositing. Adults lived for only about 8 days without food, but survived for 41–58 days with cube sugar and water at 70°F. At this temperature, more Aphids were parasitised and a higher percentage of emergence was secured than above or below it. The duration of development from egg to adult was 13–17 days at 80°F. and approximately 1 day more for each degree drop in temperature down to 60°F. Below 60°, the length of the period increased more rapidly, and at 50° the viability was greatly reduced.

ATWOOD (C. E.). **The European Spruce Sawfly Situation in western Quebec and Ontario.**—*Rep. ent. Soc. Ont.* **68** (1937) pp. 48–50. Toronto, 1938.

The distribution of *Diprion polytomum*, Htg., on spruce in eastern Canada is briefly outlined [*cf. R.A.E.*, A **26** 487]. Observations on its life-history in the extreme west of Quebec in the spring of 1937 showed the occurrence of two generations in the field in that locality [*cf.* **26** 534]. In rearing tests, the first adults emerged as early as 24th May; their offspring spun cocoons in mid-July and emerged as adults in late July or early August, and the second-brood larvae were fully grown in late September.

GRAY (D. E.). **Notes on the Occurrence of** *Diprion frutetorum* **Fabr. in southern Ontario.**—*Rep. ent. Soc. Ont.* **68** (1937) pp. 50–51. Toronto, 1938.

The European sawfly, *Diprion frutetorum*, F., was first recorded in America in 1934, on Scots pines [*Pinus sylvestris*] in the east of the Niagara peninsula, where it was well established by the autumn of 1937. In the late autumn of 1935, its cocoons were found to be heavily parasitised by *Microplectron fuscipenne*, Zett., which had been liberated early in the year [*R.A.E.*, A **25** 13].

Balch (R. E.). **Notes on the Fall Cankerworm and the Effectiveness of Banding.**—*Rep. ent. Soc. Ont.* **68** (1937) pp. 51–55, 1 fig., 7 refs. Toronto, 1938.

An account is given of experiments on the effectiveness of adhesive bands for the control of *Alsophila pometaria*, Harr., attacking elms in Fredericton, New Brunswick. When carefully applied and kept in good condition, the bands afforded considerable protection to the trees, even though newly hatched larvae were carried to them by wind [*cf. R.A.E.*, A **24** 14]; thus, when banded and unbanded trees were close together, the former showed about 45 per cent. defoliation in 1937, while the latter were completely defoliated before the larvae were mature. The bands should be applied not later than 5th October and preferably by the end of September, and daily observation for bridging by leaves or male moths should be made until about the middle of September. They should be renewed in the spring before the buds burst and retained until the larvae have gone into the ground. They should be about 5 ins. wide and should be placed as high on the trunks as can conveniently be reached for cleaning.

Dustan (G. G.). **The Effects of Temperature and certain Chemicals on Cheese Mites.**—*Rep. ent. Soc. Ont.* **68** (1937) pp. 60–67, 1 fig., 10 refs. Toronto, 1938.

An account is given of investigations in Ontario in the winter of 1936–37 on *Tyroglyphus farinae*, DeG., infesting cheese. Perfectly waxed cheese was entirely free from attack. Mites were reared successfully on soda biscuits in small glass cells at 85°F., but could not be reared on cheddar cheese if the temperature was over 60°F. for long, as the cheese became too greasy for them. They survived for 5–20 minutes at a dry heat of 106·3°F. Hot water applied as it would be if poured over a shelf killed all mites if the temperature of the water was at least 127·4°F. Boiling water poured over mites on cheese smeared on sticks of wood killed them in 2–3 seconds, and live steam turned on to the sticks killed them in 15–20 seconds when it raised the temperature to about 170°F. The average temperatures at which the last of 50 individuals became dormant and the first again became active were 26·9 and 28·7°F., respectively, the largest individuals reacting first. The smallest larvae remained dormant at temperatures of from 4·5 to 8·1°F. higher than the adults. Mites generally lived at least 11 days at 30°F. but did not survive at 0°F. for more than a few hours. They continued to feed and probably to breed slowly in cheese stores at 37–40°F.

Of liquids tested for killing mites on woodwork in infested storerooms, Javel water, caustic soda, soap, aqueous ammonia and methyl alcohol were not of much greater practical value than cold water. In experiments with formalin (40 per cent. formaldehyde) the mites were killed by contact with a 12 per cent. solution for 20 hours or a 70 per cent. solution for 30 minutes. Formalin has been recommended as a fumigant, using 500 cc. formalin per 1,000 cu. ft. air space, with 250 gm. potassium permanganate to accelerate the generation of the gas, but few mites were killed in the author's experiments when double this rate was used for fumigation. Of other fumigants tested, the only ones that gave satisfactory results were a mixture of 6·8 per cent. methyl bromide and 93·2 per cent. carbon dioxide, and a mixture of ethylene oxide and carbon dioxide (1 : 9). In experimental fumigation of cheese in an air-tight room, in which an electric fan was kept running, a complete kill of mites and their eggs was obtained in 24 hours with the mixture of methyl bromide and carbon dioxide at rates varying from 8 to 20 lb. per 1,000 cu. ft. and at temperatures of from 58 to 63°F., and with the mixture of ethylene oxide and carbon dioxide at the rate of 20 lb. per 1,000 cu. ft. With the latter fumigant, the cheese was not even temporarily tainted in flavour or odour, and, in the former, the unpleasant taste, which extended to about ¼ in. below unwaxed and exposed parts of the surface, completely disappeared after exposure to the air for 36–48 hours. Animals were apparently not affected by feeding on cheese 24 hours after fumigation.

KELSALL (A.) & STULTZ (H. T.). **Experiments relating to the Control of Armyworm,** *Cirphis unipuncta* **Haw., by poisoned Baits.**—*Rep. ent. Soc. Ont.* **68** (1937) pp. 67–70. Toronto, 1938.

Tests of arsenicals in baits for larvae of *Cirphis unipuncta*, Haw., were made in Nova Scotia in 1937. The order of effectiveness of the poisons in bran baits was : Paris green, sodium arsenite, micronised (almost colloidal) white arsenic, calcium arsenate, lead arsenate, very finely divided white arsenic, and ordinary commercial white arsenic. The corresponding order of five of them in sawdust baits, which were much less effective, was : sodium arsenite, Paris green, lead arsenate, calcium arsenate, and very finely divided white arsenic. Paris green and sodium arsenite, and then micronised white arsenic, were most rapid in action. In general, the addition of molasses to the baits improved their efficiency, particularly if they were allowed to dry for a few hours before being used. At the rate of ½ lb. metallic arsenic per 100 lb. bran, the baits were highly effective when the arsenical used was Paris green or sodium arsenite, and fairly effective when it was micronised white arsenic. Lead and calcium arsenates used at this rate gave a comparatively low mortality in 24 hours, but were fairly effective in 48 hours, particularly when molasses had been added. All the other arsenicals gave a satisfactory kill when used at the rate of 1 lb. metallic arsenic per 100 lb. bran, and when increased to 2 lb. resulted in highly effective baits, and did not appear to repel the larvae.

MITCHENER (A. V.). **A Note on the Grasshopper Situation in 1937.**—*Rep. ent. Soc. Ont.* **68** (1937) p. 70. Toronto, 1938.

Grasshoppers were quite widespread in the south-west of Manitoba in 1937 [*cf. R.A.E.*, A **25** 785] ; approximately 17 tons of prepared bait were used in the extreme south-west. The principal species involved was *Melanoplus mexicanus mexicanus*, Sauss.

WOOD (A. A.). **The Potato Scab-gnat Outbreak in Middlesex in 1937.**—*Rep. ent. Soc. Ont.* **68** (1937) p. 71. Toronto, 1938.

An outbreak of *Pnyxia scabiei*, Hopk., occurred on potatoes in the extreme south of Ontario in 1937, but was confined to light sandy soil. The infestation varied from 7 to 54 per cent., and where it was high the cavities in the tubers were more numerous and deeper. Common scab [*Actinomyces scabies*] was present in all the infested fields, and tubers already injured by scab and wireworms were in many cases attacked by the Mycetophilid larvae, but the latter were also frequently found under the unbroken skin. The infestation did not continue in the stored potatoes [*cf. R.A.E.*, A **21** 414], as the larvae had disappeared from the tubers by the first week in October, before they had been dug.

MUNRO (H. A. U.). **Some Observations on the Use of Methyl Bromide as a Fumigant.**—*Rep. ent. Soc. Ont.* **68** (1937) p. 72. Toronto, 1938.

This is a brief summary of studies in Quebec on the use of methyl bromide as a fumigant for apples. It was highly toxic to apple insects when applied at the rate of 2½ lb. per 1,000 cu. ft. and at a temperature of 80°F. In each test, an initial vacuum of 3 ins. absolute pressure was dropped to 27 ins. absolute pressure after introduction of the fumigant, the vault temperatures being maintained at 80°F. by fan circulation. In several varieties of apples, exposures of 90 and 60 minutes killed larvae of *Cydia* (*Carpocapsa*) *pomonella*, L., and *Rhagoletis pomonella*, Walsh, respectively. Eggs of *Rhagoletis* in the fruits were killed in 30 minutes, but 60 minutes was necessary for eggs of *Cydia*. In some experiments, however, it appeared that methyl bromide caused injury to apples.

LANGFORD (G. S.) & CORY (E. N.). **The Holly Leaf Miner and its Control.**—*Proc. 13th nat. Shade Tree Conf.* pp. 109–112. Baltimore, Md, September 1937.

Phytomyza ilicicola, Lw., which has been recorded from several species of holly (*Ilex*) and is widely distributed in the United States, was studied in Maryland on *Ilex opaca*, of which it is a common pest. The injury, which is that of a typical leaf-miner, was confined to the upper portion of the leaf and was not obvious until autumn, being most conspicuous in late autumn, winter and early spring. If inhabited by only one larva, the average mine was about an inch long. Both cultivated and woodland holly was damaged, and occasionally 50–75 per cent. or more of the leaves were injured. There was only one generation a year. The larvae pupated in their mines in late March and April, and the pupal stage lasted about 25–30 days. Just before pupating, the larvae prepared for emergence by making an exit hole covered by a very thin layer of leaf surface, through which the two posterior breathing spiracles were extended, thus affording a possible opportunity for control. Emergence occurred mainly in the first three weeks of May. The eggs were not observed, but are probably laid in or on the upper surface of the leaves, and hatch about 1st June. New leaves appeared to be needed for the proper growth and development of the young larvae, 6 or more of which may mature in the same leaf.

Considerable mortality occurred in both the larval and pupal stages, but it is not certain how much is due to parasites. Those reared from infested leaves were *Opius striativentris*, Gah., *Closterocerus tricinctus*, Ashm., *Chrysocharis* sp., *Pleurotropis lithocolletidis*, Ashm., and *Sphegigaster* sp.; the last two are possibly secondary parasites.

The larvae and pupae in the mines were not killed by sprays containing nicotine, rotenone dust or pyrethrum, and the pupae were not effectively controlled by tent fumigation for an hour with hydrocyanic acid gas generated with sulphuric acid from sodium cyanide (2 oz. to 100 cu. ft. tent space). The best method of reducing infestation appears to be hand picking and destroying the infested leaves in late winter or early spring before the adults start to emerge.

MACLEOD (G. F.). **Sulphur as a Control for the Eastern Tent Caterpillar.** —*Proc. 13th nat. Shade Tree Conf.* pp. 112–117. Baltimore, Md, September 1937.

A study of the effectiveness of sulphur against the eastern tent caterpillar [*Malacosoma americana*, F.], which is a common pest of fruit and shade trees [*R.A.E.*, A **24** 117] in the north-eastern United States, was begun in the laboratory in the winter of 1935. Newly hatched larvae were killed about as rapidly when feeding on foliage dusted with 325-mesh dusting sulphur as with sulphur-arsenic combinations ; all larvae on dusted foliage died in 4 or 5 days while only 2 per cent. died on untreated twigs. Further experiments with 200-mesh sulphur and newly hatched or half-grown larvae were made to test the possibility that the larvae were killed by gas released from the dust or that it acted as a repellent so that they were starved. Larvae dusted and placed on untreated twigs were all rapidly growing a fortnight later, and those held without food or dust treatment only began to die after 10 days, but those placed on dusted twigs fed for a few hours and 94 per cent. were dead in 6 days ; radiographs showed the sulphur particles packed in the rear part of the intestine.

In the spring of 1936, sulphur was used in large-scale field experiments in New York State, both as a dust and in water suspensions as a spray, and control was obtained with a single application in every case. The dusts did not adhere so well as the sprays, but the spring rainfall was less than usual. Heavy rains in the spring of 1937 permitted adequate tests of the adhesiveness of the preparations, which is of great importance. For sprays, it was found satisfactory to use commercially prepared wettable sulphurs or dusting sulphurs with a suitable wetting agent, such as blood albumen, casein, soybean meal or resins ; where soaps were used the sulphur residue was lost more rapidly. The adhesive properties of sulphur dusting mixtures varied greatly. There is no doubt, however, that dusts and sprays give a complete kill if the foliage remains coated for at least a week. Since half-grown larvae are susceptible, it is better to defer application until all the eggs have hatched. In sprays, the sulphur should be used at the rate of 30 lb. per 100 U.S. gals. Any dusting sulphur of 325-mesh fineness, or even finer, will give satisfactory control. So far as is known, sulphur is harmless in every sense, a point of importance in any large-scale control programme in densely settled areas.

HAMILTON (C. C.). **Tests with Derris Powder or Cubé Powder in Rosin Residue Emulsion Sprays for the Control of Shade Tree Insects.**—*Proc. 13th nat. Shade Tree Conf.* pp. 140–150. Baltimore, Md, September 1937.

Reports of co-operative experiments carried out in 1937 in 14 of the United States showed that a spray consisting of 4 lb. derris or cubé powder (containing 4 per cent. rotenone and 16–18 per cent. total extractives), 4 lb. resin residue emulsion and 100 U.S. gals. water [*cf. R.A.E.*, A **24** 727, 773] had considerable possibilities for the control of certain leaf-eating insects where an arsenical spray was not desirable. Whether made with cubé or derris powder, the spray appeared equally effective both as a contact insecticide and as a repellent.

A table shows the control obtained in tests on various insects, and it is concluded that it is best to spray against leaf-eating larvae of Lepidoptera and Coleoptera when they are not more than half grown ; the spray acts against these chiefly as a contact insecticide, whereas in the case of adult beetles it acts almost entirely as a repellent. Most of the smooth caterpillars and certain leaf-eating Coleopterous larvae were killed by contact, and the spray had some contact and repellent action against the adults of the latter. Various Lamellicorn beetles were repelled from feeding for 4–8 days or more after spraying. Weekly applications prevented the Japanese beetle [*Popillia japonica*, Newm.] from injuring a number of trees, shrubs and flowers severely. Effective control was obtained of larvae of the bagworm [*Thyridopteryx ephemeraeformis*, Haw.] not more than two-thirds grown and of the larch case-bearer [*Coleophora laricella*, Hb.], in both cases apparently by repellent action. Sawfly larvae of various species were fairly easily killed, even when almost full-grown. The sprays were also effective against sucking insects, such as smooth Aphids and Tingids, and the active stages, but not the eggs, of several species of Tetranychid mites ; hairy caterpillars or those protected by rolled leaves, and Aphids or scale insects with a woolly covering, were not controlled.

HOUSER (J. S.). **Borer Control Experiments.**—*Proc. 13th nat. Shade Tree Conf.* pp. 159–168. Baltimore, Md, September 1937.

Increasing damage by wood-boring beetles to newly-set shade trees in Ohio in 1932–34 led to an investigation of treatments to prevent infestation of maple and elm trees, mostly planted near a borer-infested native woodland in the autumn of 1935. The treatments were applied between 14th and 22nd May 1936, before any egg-laying borer beetles had appeared. *Chrysobothris femorata*, Ol., was the borer observed in greatest numbers.

The maples were examined in October 1936 and the elms in August 1937. The treatments, which did not seem to damage the trees, consisted in wrapping the trunks with burlap or crêpe paper or applying to them paints, the formulae for which are given. Of the paints, various emulsions of paraffin wax, with or without the addition of barium fluosilicate, were ineffective on both maples and elms. A liquid grafting wax with barium fluosilicate was ineffective on the maples, but infestation of elms treated with it was only about 20 per cent. of that on untreated elms. It is considered, however, that this paint is too difficult to prepare and apply for practical use. All the wrappings, on the other hand, gave practically complete protection on both maples and elms. The cheapest and most convenient was a 4 in.-width of double thickness Craft crêpe paper, with a layer of asphaltum between, wound spirally with a 50 per cent. overlap. The wrapping should proceed downward from the crown and extend to the base of the tree.

[**Papers on Orchard Pests and their Control.**]—*Trans. Ill. hort. Soc.* 1936 **70** 477 pp., illus. Springfield, Ill., 1937.

In Oriental Fruit Moth Studies in 1936 (pp. 251–259), S. C. Chandler and W. P. Flint report that the percentage infestation of peaches by the oriental fruit moth [*Cydia molesta*, Busck] at harvest in southern Illinois, which in 1935 had averaged 22·1 [*cf. R.A.E.*, A **24** 367], was reduced by the combined effect of low winter temperatures, the hot dry summer and parasitism to 3·3 in 1936. Parasitism averaged 17·3 per cent., half of which was due to *Macrocentrus ancylivorus*, Rohw. [*cf.* **24** 368]. In control experiments, a proprietary dust containing oil, sulphur, and talc and lime in the proportion of 5 : 57 : 38 [*cf.* **26** 125] gave 96 per cent. control, and this was not improved by the use of dusts containing, in addition, 1 per cent. rotenone with or without bentonite sulphur, or ½ per cent. each of rotenone and nicotine. It was as satisfactory to apply the dust at the appearance of the third-generation larvae, about a month before harvest, as during the attack of the second generation. Dusts of phenothiazine [thiodiphenylamine] applied on 17th, 24th and 31st July at the rate of ½ lb. per tree gave 50 per cent. control. A commercial fixed nicotine spray (Black Leaf 155–0, 3 lb. per 100 U.S. gals.) showed good promise. In bait traps, brown sugar was more than twice as effective as molasses.

In Recent Developments in Codling Moth Control in the Pacific Northwest (pp. 265–274), E. J. Newcomer gives an account, largely quoted from a paper already noticed [**25** 418], of inverted sprays of lead arsenate and oil against the codling moth [*Cydia pomonella*, L.] on apple in Washington, and recapitulates work on the use of calcium arsenate and phenothiazine [thiodiphenylamine] in sprays [*cf.* **24** 319 ; **25** 345]. It is doubtful whether the inverted mixture of lead arsenate and oil would be satisfactory in areas, such as Illinois, where a fungicide would have to be used with it, as the two might not be compatible, and a light application is desirable with a fungicide, whereas heavy applications are necessary for the best results with the inverted spray.

In Three Years' Tests with fixed Nicotines (pp. 438–445), W. P. Flint tabulates the results of work in western Illinois in 1934–36 with various fixed nicotine sprays for the control of *C. pomonella* on apple. He states that these sprays, several of which were practically as effective as lead arsenate and injured the foliage less, also controlled leafhoppers satisfactorily and left no objectionable residue ; the benefits derived probably compensated for increased costs.

In The Codling Moth Survey of 1936 (pp. 445–454), S. C. Chandler and W. P. Flint give figures for the average annual infestation of apples in orchards in southern Illinois by *C. pomonella* in 1930–36, and explain the rise from 4·7 per cent. in 1935 to 26·2 per cent. in 1936 by the light crop in that year, although this was effect as well as cause, and weather conditions favourable to the moth. Details are given of a number of orchards where infestation was reduced to 2 per cent. or less by orchard sanitation and timely spray schedules. Failure to obtain control was due principally to the heavy carry-over, the use of a shortened spray schedule involving too few second-brood sprays, a change from the standard spray materials to avoid arsenical residue, and insufficient banding. The infestation was almost as severe in central Illinois. A table shows the spray schedules employed and the results obtained in 1936 in 9 orchards in the south and west of the state, where infestations of under 5 per cent. were recorded.

In The San José Scale Survey of 1936 (pp. 454–456), S. C. Chandler reports that moderate to severe infestation of apples and peaches in Illinois by the San José scale [*Aonidiella perniciosa*, Comst.] occurred in 33·7 and 45·4 per cent. of orchards, respectively, in 1935, and in 14·8 and 29·2 per cent. in 1936, in spite of the heavy mortality during the intermediate winter. In 1936 the infestation increased progressively from the north to the south of the state. The standard recommendation is a dormant spray every year, but this might possibly be omitted in the north.

STEARNS (L. A.). **Important Insects of the Year.**—*Bull. Del. agric. Exp. Sta.* no. 207 (Rep. 1936–37) pp. 29–30. Newark, Del., September 1937.

In a light trap operated in the north of Delaware during the spring and summer of 1936, only 79 adults of 8 species of *Lachnosterna* (*Phyllophaga*) were captured [*cf. R.A.E.*, A **25** 465]. In the same locality, damage by *Popillia japonica*, Newm., increased greatly in 1937, the numbers of grubs per sq. yard averaging 46, as compared with 4 in 1936. Although 60 colonies of the parasites, *Tiphia vernalis*, Rohw., and *T. popilliavora*, Rohw., were liberated between 1934 and 1936, there is no sign of their having become established. In a survey on the distribution of *Pyrausta nubilalis*, Hb., in the county in which it was recorded, for the first time in Delaware, in 1934, only 3 out of 30 maize fields examined in 1936 were infested, the numbers of larvae averaging 1·1 per 100 plants. Infestation of beans by *Epilachna varivestis*, Muls., was below the average in 1936, but there was a high rate of winter survival and considerable injury resulted in 1937. Other pests that caused serious losses in 1937 were *Anthonomus signatus*, Say, on strawberry, *Macrosiphum onobrychis*, Boy. (*Illinoia pisi*, Kalt.) on lucerne and peas and *Cirphis unipuncta*, Haw., on wheat and maize.

LUND (H. O.). **Studies on Longevity and Productivity in** *Trichogramma evanescens*.—*J. agric. Res.* **56** no. 6 pp. 421–439, 3 diagr., 30 refs. Washington, D.C., 1938.

The following are the author's summary and conclusions: The longevity and productivity of *Trichogramma evanescens*, Westw., reared in eggs of *Sitotroga cerealella*, Ol., were tested under various conditions of feeding, withholding host eggs, pairing, superparasitism, light, temperature and humidity. From the experimental data, the following results were obtained and conclusions drawn: The average number of progeny produced at 25°C. [77°F.] and 5-mm. saturation deficiency is $66{\cdot}1 \pm 2{\cdot}5$, the female longevity $6{\cdot}3 \pm 0{\cdot}3$ days, the male longevity $5{\cdot}7 \pm 0{\cdot}2$ days, and the sex ratio 0·66 female. A correlation of $+0{\cdot}639 \pm 0{\cdot}071$ exists between the longevity of mated females and their productivity. Since females fed on dilute honey live longer and produce more progeny than unfed females, parasites should be fed before liberation in the field. Females live longer when host eggs are present than when they are absent, but if the eggs are withheld for 48 or 72 hours, female longevity is unaffected, while productivity is reduced. Therefore only young parasites should be liberated in the field. Pairing reduces productivity, but leaves longevity unaffected. Females emerging from superparasitised host eggs produce fewer progeny than normal females, but live as long. Males reared under the same conditions, while sexually potent, are shorter-lived than normal males. Females kept in diffused light live slightly longer than females kept in total darkness, but produce the same number of progeny. Adult longevity varies inversely as the temperature to which the adults are subjected, but directly as the temperature to which their developmental stages are exposed ; the optimum temperature for productivity is about 25°C. in either case. These facts suggest that the most favourable field temperature at which to liberate the parasites for pest control is probably just under 25°C., whereas the most favourable laboratory breeding temperature is about 30°C. [86°F.].

An abnormally high proportion of male progeny is produced by parasites developing at 15°C. [59°F.] (only 0·42 female).

When adults are subjected to either low (10-mm. or 15-mm. saturation deficiency) or high (saturation) humidities, their productivity is somewhat reduced, but relatively less so than their longevity, and the total water lost before death is about the same at both " dry " conditions ; but, conversely, when the immature stages are exposed to low or high humidities, the productivity of the subsequently emerging adults is decidedly reduced while the longevity is unaffected. The most favourable field humidity at which to liberate the parasites would appear to be 5-mm. saturation deficiency or less, but laboratory breeding conditions of 10-mm. saturation deficiency or less are probably satisfactory.

Felt (E. P.) & Bromley (S. W.). **Shade Tree Insects and Sprays, 1937.** —*J. econ. Ent.* **31** no. 2 pp. 173–176. Menasha, Wis., April 1938.

A serious infestation of holly by *Phytomyza ilicicola*, Lw., occurred in the spring of 1937 in south-western Connecticut. Leaves with partly extruded puparia [*cf. R.A.E.*, A **26** 541] were treated in the laboratory with a combination of Volck oil (2 per cent.) and nicotine sulphate (1 : 800), but the resulting kill of 82·5 per cent. was not considered satisfactory. Laboratory experiments and tests in the open showed that lead arsenate gave a quick kill of the adults. In cages, unsprayed foliage was practically destroyed by oviposition punctures, whereas leaves sprayed with 5 lb. lead arsenate and 1 lb. S.S.S. spreader per 100 U.S. gals. water were practically unharmed.

In investigations on the club gall of dogwood [*Cornus*], 20 examples of *Mycodiplosis alternata*, Felt, 26 of *Porricondyla* sp., and a number of inquilines or predators were reared from several hundred galls collected during the preceding season. The senior author considers that *Mycodiplosis* is probably the gall producer, though the relative abundance of *Porricondyla* makes it doubtful whether it is gall-producing or inquiline. Observations in 1936 showed that the larvae deserted the galls late in September or early in October, and on 15th October 1937, 60 per cent. of the galls were empty. Some control was effected by a spray of molasses (1 : 10) and nicotine sulphate (1 : 800) in shady areas ; in the sun, the spray probably dried too quickly. Destroying the galls before mid-September should give satisfactory control on isolated stands.

A small elm 1–2 ft. high sprayed with lead arsenate and S.S.S. spreader (5 and ½ lb. to 100 U.S. gals., respectively) was only lightly attacked by 60 adults of *Scolytus multistriatus*, Marsh., caged on it, while a similar number of beetles on an unsprayed tree removed much of the bark and caused a large portion of the top to die from mechanical injury. When the experiment was repeated with 2 lb. spreader and over 100 beetles, the lead arsenate ran off more, but serious injury was prevented. The unsprayed tree died down to the ground. At the end of the season, the scars on the sprayed trees, which were not so numerous or so deep as those on the unsprayed trees, were completely healed. Further data obtained by releasing balloons [**25** 374] confirmed the view that wind drift may be an important factor in the dissemination of insects carrying Dutch elm disease [*Ceratostomella ulmi*].

Paria canella, F., was unusually abundant on filberts [*Corylus*] in Connecticut that had not received the customary spray of lead arsenate, which was found in preceding years to scorch the foliage. Cryolite gave temporary control, but did not adhere well. *Lepidosaphes ulmi*, L., occurred in great abundance on the smaller branches of woodland beech in western Massachusetts, killing many of the small twigs. Larvae of *Prionus laticollis*, Dru., were found boring in flowering dogwood [*Cornus florida*] on Long Island. A tree with a trunk some 4 ins. in diameter was partly girdled 5 or 6 ins. below the surface of the ground. *Saperda candida*, F., was reared in numbers from *Cotoneaster*, to which it had caused considerably injury, in Connecticut. Specimens of rhododendron from an estate in eastern Pennsylvania were found to be badly infested with *Eriococcus azaleae*, Comst.

Comparative tests of lead arsenate (5 lb. per 100 U.S. gals. with ½ lb. S.S.S. spreader), cryolite (4 lb. per 100 U.S. gals. with 2 lb. S.S.S. spreader) and derris (4 lb. powder, said to contain 4 per cent. rotenone and 15–16 per cent. total ether extractives, per 100 U.S. gals. with 2 U.S. qts. resin residue emulsion) were made on a woodland border of deciduous trees up to 90 ft. in height. The temperature was 63°F. during the application. Heavy rain fell later in the day and washed off the cryolite and derris, but the lead arsenate adhered for several months. All materials gave a good initial kill of *Alsophila pometaria*, Harr.; lead arsenate gave the most lasting protection. Derris gave poor control of *Argyrotoxa semipurpurana*, Kearfott, on pin oak as the larvae were protected by the roll of the leaf; cryolite gave better, and lead arsenate complete control. No spray injury was observed on any of the trees, which were of many different kinds.

FRIEND (R. B.) & PLUMB (G. H.). **Control of the European Pine Shoot Moth.**—*J. econ. Ent.* **31** no. 2 pp. 176–183, 17 refs. Menasha, Wis., April 1938.

Derris containing 4 per cent. rotenone and 14 per cent. total ether extractives and cubé with the same analysis were compared with lead arsenate in 1936 and 1937, respectively, for the control of *Rhyacionia buoliana*, Schiff., on red pine [*Pinus resinosa*] in Connecticut. In both years, rainfall was much heavier after the first than after subsequent applications. In 1936, three substances were compared with fish oil as spreaders and adhesives for lead arsenate and two were tested with derris. Derris and cubé were used at 4 lb. per 100 U.S. gals. and lead arsenate at 3 lb. except when mixed with Igepon T, in which case 3 lb. 5 oz. of a prepared mixture was used. Plots were sprayed on 10th June, 22nd June or 7th July or on 10th and 22nd June. No treatment was effective when applied on 10th June only. All lead arsenate treatments gave best control when applied once on 7th July, except those containing waterproof glue. Lead arsenate did not give appreciable control with Igepon T, and with 3 oz. SS_3 gave a maximum reduction of infested tips of 63 per cent. Two applications containing 1 U.S. pt. fish oil on 10th and 22nd June and one on 7th July gave 55 and 74 per cent. reduction in infested tips, respectively, and when 1 lb. waterproof glue was substituted for the fish oil, the figures were 72 and 60. Derris with 1 lb. powdered skim milk applied on 22nd June, 10th and 22nd June, and 7th July gave, respectively, 80, 82, and 75 per cent. reduction in infested tips. When 3 oz. SS_3 was substituted for the milk, the reductions were 80, 72 and 61 per cent. The differences between the 61 and 80 per cent. reductions or the 75 per cent. with derris and milk on the same date are significant.

The experiments were continued in 1937, when sprays of 4 lb. cubé and 1 lb. powdered skim milk were compared with 3 lb. lead arsenate and 1 U.S. pt. fish oil both in 100 U.S. gals. water. Applications were made on 14th and 22nd June and 2nd and 12th July, and all combinations of 1, 2, 3 and 4 applications were made. The best single, double and triple applications of lead arsenate were made on 2nd July, 2nd and 12th July, and 22nd June and 2nd and 12th July and gave, respectively, 41, 87, and 91 per cent. reduction in injured tips. Results with 4 applications were no better than with 3. The difference between the best single and double applications is significant, but that between the best double and triple is not. The best single and double applications of cubé, made on 2nd July and 2nd and 12th July gave 89 and 99 per cent. reduction in injured tips, respectively. The difference is significant. Under field conditions, any degree of control exceeding 90 per cent. reduction in injured tips should be satisfactory. All trees sprayed with cubé were significantly better than unsprayed control trees.

Experiments on the durability of ground cubé root and lead arsenate on pine twigs were also conducted. Twigs were sprayed under field conditions and newly-hatched larvae were allowed to feed on samples brought to the laboratory after various intervals, and the number of bored needle clusters on each twig determined after 5–7 days. In addition to the combinations used in the previous experiment, cubé with resin residue emulsion or Ultrawet (a sodium sulphonate of crude petroleum) at the rate of 4 lb. and 3 U.S. pts. or 0·5 lb. per 100 U.S. gals. was tested. With exposures of 9 days or less, the materials were about equally effective. In one test made after 11 days, cubé and resin residue emulsion was less effective than the other mixtures. A few tests made after 12–14 days showed a rapid decline in the effectiveness of all the cubé sprays.

GAMBRELL (F. L.). **Experiments for Control of the Pine Needle Scale,** *Chionaspis pinifoliae* **(Fitch).**—*J. econ. Ent.* **31** no. 2 pp. 183–186, 3 refs. Menasha, Wis., April 1938.

An account is given of the seasonal history of *Chionaspis pinifoliae*, Fitch, on pine in areas of western New York where two generations occur annually [*cf. R.A.E.*, A **17** 379]. The Coccid usually overwinters in the egg stage, though females sometimes pass the winter and oviposit the following spring. Hatching begins during late May and is usually completed by the first week in June. During wet, cool weather, the young may remain beneath the old female scale for several days, but in warm weather, they move about freely and settle on fresh portions of the needle soon after hatching. If the infestation is heavy, some remain permanently under the old scale. Females reach maturity by early July and oviposit about the middle of July. Young from these eggs hatch in the second half of July and early August, and mature and begin to oviposit about mid-September. In 1936, more than 80 per cent. of the females had deposited at least some eggs by 22nd October, but some gravid females were found beneath the scales in the spring of 1937. Where two generations occur, the crawlers of the first usually settle on needles that have developed in the previous year, while those of the second migrate in large numbers to new needles.

Experiments were carried out in 1936 and 1937 on the control of the Coccid by applications of sprays against the eggs in April and against the crawlers in summer. The results for 1936 have already been noticed [**26** 270]. In 1937, DN oil [oil impregnated with dinitro-ortho-cyclo-hexylphenol] applied on 30th April at a concentration of 1 per cent. caused only slight foliage injury on *Pinus resinosa* and little or none on *P. sylvestris* and gave complete control. As regards the sprays of nicotine sulphate with soap or oil [*loc. cit.*], which are effective against the crawlers, it was found that the oil mixture is superior as it also gave an excellent kill of nymphs that had begun to secrete the scale, so that its use permits some extension of the normal effective spraying period.

DOMINICK (C. B.). **Notes on the Locust Leaf Miner,** *Chalepus dorsalis* **Thunb.**—*J. econ. Ent.* **31** no. 2 pp. 186–189, 1 fig., 7 refs. Menasha, Wis., April 1938.

For many years, the leaves of black locust trees (*Robinia pseudacacia*) in Virginia, especially in the mountainous area in the west, have been severely injured by the Hispid, *Chalepus dorsalis*, Thnb. The author observed it also in eastern Tennessee in 1935. The Tineid leaf-miner, *Parectopa robiniella*, Clem., also occurs on *R. pseudacacia* in several sections of Virginia and is sometimes abundant. Both adults and larvae of *C. dorsalis* feed on the leaves, but the damage done by the adults is comparatively slight. They make small holes in the very young leaves early in the season, but later, eat the upper surface only. The larvae mine in the interior of the leaf, leaving the upper and lower epidermis intact except for the entrance and exit holes. If infestation is severe, the foliage turns brown by mid-summer, but no trees have been observed to die as the result of attack.

In 1937, overwintered adults appeared first on small trees near leaves, grass and thick undergrowth, which are favourable hibernation quarters. Near Blackburg (Virginia), the beetles became numerous between 5th and 15th May; feeding was extensive, and the injured foliage had begun to turn brown 5 days later. Eggs were first laid in the insectary and observed in the field on 24th May, and were numerous in the field by 5th June. They are laid on the under sides of the leaves in masses of 3–5 covered with excrement. Females deposited 53–116 eggs, the average for 10 being 74·1. The larvae hatched in 9–11 days and immediately entered the leaf, those from the same mass occupying the same mine for 3–4 days, after which they ate through the epidermis, left the mine and entered another leaf. Two full-grown larvae were seldom observed in the same mine, and one larva frequently occupied several mines during the feeding period. The larval and pupal stages lasted 15–20 and 7–12 days. The adult remains in the mine for about 2 days after emergence, after which it eats through the epidermis. First-generation adults were abundant by the end of July. In addition to *R. pseudacacia*, the beetles fed on apple and oak leaves in the field and on a number of other plants in cages, but no eggs were found on any plants except *R. pseudacacia*. Only one generation was observed in 1937. The adults fed for about 3 weeks and then disappeared. Adults confined in rearing cages did not oviposit and no pairing was observed. A spray of 3 lb. lead arsenate, 12 oz. fish-oil soap and 50 U.S. gals. water applied on 22nd May and 1st June appeared to repel the adults, as no eggs were deposited and little feeding took place ; and 15 pairs of adults caged on 11th June on a potted plant of *R. pseudacacia* previously sprayed with lead arsenate and molasses died within 3 days.

HAMILTON (C. C.). **Studies on the Control of the Orchid Weevil.**—*J. econ. Ent.* **31** no. 2 pp. 189–192, 3 refs. Menasha, Wis., April 1938.

Since *Diorymerellus laevimargo*, Champ., was first observed in New Jersey [*R.A.E.*, A **5** 140], it has been recorded from various parts of the United States, and apparently occurs wherever orchids are grown. The larva and adult are briefly described ; the eggs and pupae have not been observed. The young larvae feed on the new roots of the orchid, hollowing them out and causing the tips to turn black and die. The adults apparently hide in the peat near the top of the pot, in the curled up basal part of the leaf or in the sheath surrounding the flower stalk. They feed slightly on the roots, but cause most injury by feeding on the tender leaves, the sheath surrounding the flower bud or the petals before or just after they open, making small irregular holes and causing the blooms to open imperfectly and the sheath to rot and die.

As hand-picking did not give satisfactory control and paradichlorobenzene [**20** 678] sometimes injured the plants, preliminary experiments were carried out in New Jersey in August 1936 with a concentrated pyrethrum dust known as Dry Pyrocide consisting of an alcohol extract of pyrethrum dispersed upon clay to make a mixture containing 40 per cent. extractives and 5 per cent. pyrethrins I and II, and a concentrated derris powder containing 3 per cent. rotenone and about 15 per cent. total extractives, both diluted with 1 and 2 parts clay. Dry Pyrocide was effective whether dusted on the beetles or on the peat in which they were concealed. In August 1937, beetles were collected and placed on peat tightly packed in flower pots. When they had had the opportunity to crawl into the peat, the surface was dusted with pyrethrum powder containing 0·9 per cent. pyrethrins with and without a pine oil activating agent, Dry Pyrocide containing 2 per cent. pyrethrins alone and diluted with an equal amount of talc, or derris powder containing 4 per cent. rotenone with the activating agent. The derris gave very poor results, the pyrethrum moderate results and the Dry Pyrocide excellent results. On 17th August, the pyrethrum powder was compared with Dry Pyrocide alone and mixed with 50 and 75 per cent. talc, all applied at the rate of 0·5 gm. per 4 in. pot and 0·25 gm. per 3 in. pot. All gave excellent control. A slight apparent superiority of Dry Pyrocide may have been due to the finer particle size. The same materials applied at the rate of 1·5 gm. to a 4 in. pot did not injure the peat or the roots or foliage of the orchids.

COLLINS (C. W.). **Two Elm Scolytids in relation to Areas infected with the Dutch Elm Disease Fungus.**—*J. econ. Ent.* **31** no. 2 pp. 192–195, 1 fig. Menasha, Wis., April 1938.

The early records of *Scolytus multistriatus*, Marsh., and its present distribution and that of *Hylastes* (*Hylurgopinus*) *rufipes*, Eichh., in the eastern United States in relation to the areas infected with Dutch elm disease caused by *Ceratostomella ulmi* are given, and the distribution of *S. multistriatus* and the disease is shown on a map. Both Scolytids occur in the major area infected with Dutch elm disease and also in areas where it is unknown, but in certain outlying points where trees infected with the disease have been found, *H. rufipes* is known to be present and *S. multistriatus* is not.

COLLINS (D. L.). **Feeding Habits of** *Scolytus multistriatus* **Marsham with reference to the Dutch Elm Disease.**—*J. econ. Ent.* **31** no. 2 pp. 196–200, 2 figs. Menasha, Wis., April 1938.

The following is substantially the author's summary of investigations on the feeding habits of *Scolytus multistriatus*, Marsh., carried out in New York: The number of wounds per sample of elm branch is suggested as a basis of comparison for the systematic study of the feeding habits of *S. multistriatus*. There is extreme variation in the range and extent of feeding. Observations made on more than 500 trees, including the examination of more than 100,000 crotches, indicated that the presence of wood that is either attracting or producing beetles in or near a given tree renders that tree more favourable for feeding. The exact value of spraying as a control measure remains in doubt, but it is increasingly indicated that the destruction of injured, dying and dead elm wood should not only aid materially in the control of the beetles by destroying their breeding places, but also should aid in reducing the spread of Dutch elm disease [*Ceratostomella ulmi*] by rendering healthy trees less subject to feeding attacks by possibly contaminated beetles.

DIETZ (H. F.) & PIERPONT (R. L.). **Japanese Beetle Field Control Tests in Delaware.**—*J. econ. Ent.* **31** no. 2 pp. 200–204, 8 refs. Menasha, Wis., April 1938.

Experiments were carried out during 1937 in Delaware to determine the relative efficiency of several combinations of ground derris and of certain synthetic organic compounds in combination with various adhesives for the protection of apple and peach foliage against *Popillia japonica*, Newm. The first application was made as soon as the beetles invaded the orchard, and the second as soon as any invaded the plots that had received the better treatments. The 5 most effective treatments, with quantities per 100 U.S. gals. water, were 5 lb. tetramethyl thiuram bisulphide and 1½ lb. resin residue emulsion [*R.A.E.*, A **24** 727], 3 lb. thiodiphenylamine (phenothiazine) and 1 lb. resin residue emulsion, 2½ lb. tetramethyl thiuram bisulphide and 1 lb. resin residue emulsion, applied two or three times, and 4 lb. ground derris and 4 lb. resin residue emulsion [*cf.* **25** 424]. Hydrated lime at 20 lb. did not compare favourably with the best treatments, and could not be used on peach as the residue could not be removed. It was most satisfactory when used with 4 lb. resin residue emulsion ; as good a load was applied with fish oil as with aluminium sulphate [**24** 529], but control was much inferior. The fish oil may have acted as an attractant.

Gardner (T. R.). **Influence of feeding Habits of *Tiphia vernalis* on the Parasitization of the Japanese Beetle.**—*J. econ. Ent.* **31** no. 2 pp. 204–207. Menasha, Wis., April 1938.

As observations of colonies of *Tiphia vernalis*, Rohw., established in areas infested with *Popillia japonica*, Newm. [*R.A.E.*, A **22** 412] have shown that the adults, which feed on honeydew, are attracted to trees and shrubs infested with Aphids, and that larvae of *P. japonica* near such feeding areas are more heavily parasitised than others, surveys were made at two sites in Pennsylvania, where liberations of *T. vernalis* had been made, to determine the degree of parasitism and superparasitism effected near the area of concentrated adult feeding. Surveys of one site in 1935 and 1936 and of another in 1936 showed 61·6, 47·2 and 58·2 per cent. parasitism near feeding centres. The rate declined as the distance from them increased. As a female of *T. vernalis* does not differentiate between parasitised host larvae and others, and destroys eggs and young larvae already on a host by kneading and rasping its integument to soften it when preparing to oviposit, an examination was made for superparasitism. Of the three lots of host larvae, 40·6, 20·9 and 40·4 per cent. had 1–10, 1–13, and 1–14 egg-scars, respectively, and the egg wastages in the three lists were 62·1, 52·2 and 66·0 per cent. As females of *T. vernalis* either drop to the ground after feeding or fly a very short distance before entering the soil in search of a host, counts were made every 14 ft. from the point of concentration to determine the relation between superparasitism and distance from the adult feeding area. The average number of eggs laid per host larva was found to decrease as the distance increased within a certain area, beyond which there was no indication of superparasitism.

Nelson (R. H.). **Tartar Emetic as a Field Spray against the Gladiolus Thrips.**—*J. econ. Ent.* **31** no. 2 pp. 208–211, 9 refs. Menasha, Wis., April 1938.

As sprays containing Paris green [*R.A.E.*, A **21** 287, 466], manganese arsenate [**24** 249] or lead arsenate for the control of *Taeniothrips simplex*, Morison, all tend to scorch the foliage of *Gladiolus*, many other materials were tested, one of which, tartar emetic (antimony potassium tartrate) [*cf.* **23** 3], tested on forced plants in the greenhouse, gave control equal to the Paris green and did not injure the foliage. In 1937, 7 sprays containing tartar emetic and 2 containing Paris green were compared in the field in Maryland. Per 100 U.S. gals. water, 16, 32 and 64 lb. brown sugar were used with 8 and 4 lb. tartar emetic (as it was desired, if possible, to reduce the quantities of sugar, which made the foliage sticky), and 64 lb. sugar with 2 lb. Paris green ; and 1 U.S. qt. ammonium caseinate and resin residue emulsion [**24** 727] as a spreader and adhesive was tested instead of the sugar with 8 lb. tartar emetic and with 2 lb. Paris green. The Latin square plot arrangement [**25** 428] was used and 5,000 corms of each of 2 varieties were planted for the experiments. However, one variety became infected with scab and results on it were disregarded. Six weekly applications of spray were made, beginning on 24th June, and observations on the effect of the sprays on the foliage were made as spraying progressed and about 3 weeks after the final application. None of the tartar emetic sprays caused scorching and there was little evidence of feeding by thrips except on the plot sprayed with the unsweetened combination ; both treatments of Paris green caused typical injury, one or two of the lower leaves becoming partly or entirely brown and the upper leaves having scorched spots, especially in areas where thrips had fed, which were more extensive on the plants sprayed with the unsweetened mixture. On the control plots, there were large areas on which feeding had taken place on most of the plants. The flowers were gathered at intervals of 2 or 3 days and divided into injured and uninjured, and the percentage control calculated according to Abbott's formula [**13** 331]. All sprays containing brown sugar gave over 86·5 per cent. control, but the unsweetened tartar emetic and Paris green gave only 29·9 and 63·3 per cent., respectively. The data on the percentage of uninjured spikes cut from each plot were subjected to an analysis of variance. All the sprays caused a very significant increase in the mean percentage of uninjured spikes as compared with the control, the 7 sprays containing brown sugar gave results significantly better than the two unsweetened combinations, and there was no significant difference between the sweetened sprays. The corms from the plots that received Paris green increased considerably less in weight than those in the plots treated with tartar emetic or the control plots. The costs per 100 U.S. gals. of the weakest tartar emetic and brown sugar spray and the Paris green and brown sugar were about 13*s*. and 17*s*., respectively.

WEIGEL (C. A.) & NELSON (R. H.). **Insecticidal Tests against Red Spiders and Thrips on Greenhouse Tomatoes and Cucumbers.**—*J. econ. Ent.* **31** no. 2 pp. 211–216, 2 refs. Menasha, Wis., April 1938.

The following is substantially the authors' summary of the results of two series of tests carried out in Maryland in 1937 on the control of *Tetranychus telarius*, L., on tomatos and cucumbers and *Thrips tabaci*, Lind., on cucumbers in the greenhouse : The results of the first series indicate that a derris spray having a rotenone content of 0·0056 per cent. is as effective as one with a 0·0112 per cent. rotenone content when sulphonated castor oil is used as a spreader ; that the derris sprays used in these tests are superior to cubé sprays of the same rotenone content, the difference being explainable on the basis of the total extractives ; that the addition of pyrethrum extract aids in killing thrips, but does not improve the effectiveness of the spray against the red spider ; that with sprays of the same rotenone content with sulphonated castor oil as a spreader, the kill is better than with either alkylphenylbenzenesulphonic acid or ammonium caseinate with resin residue ; and that one of two proprietary thiocyanate sprays tested is as effective as the derris spray plus sulphonated castor oil. The red spider population on plots in which poor control was obtained during the first series showed a continued build-up in numbers at the end of the second series, whereas in plots showing good control in the first series the increase in numbers was negligible in the second series. None of the derris or cubé sprays plus the spreader or the proprietary thiocyanate caused any permanent injury to either tomato or cucumber.

The other thiocyanate spray tested with a sodium oleyl sulphate plus synthetic resin spreader caused severe injury to both the foliage and fruit of tomato.

On the sprayed plants, the foliage remained greener much longer than on the control plants, and the sprayed plants continued to bear fruit much longer than the control plants. The average number of living red spiders per leaf in the effectively sprayed plots for the two series was very low in contrast to the controls, and the plants continued to make a healthy growth.

HOUGH (W. S.). **The Use of Nicotine in Codling Moth Control with special Reference to its Effectiveness in killing Moths.**—*J. econ. Ent.* **31** no. 2 pp. 216–221, 1 fig., 12 refs. Menasha, Wis., April 1938.

Tests made in 1934 and 1937 showed that nicotine sulphate (1 pt. Black Leaf 40 per 100 gals.) was an effective ovicide for eggs of the codling moth [*Cydia pomonella*, L.] due to hatch in less than one day after being sprayed, but its effectiveness decreased rapidly as younger eggs were used [*cf. R.A.E.*, A **24** 721]. Nicotine bentonite (Black Leaf 155 made according to the 1934 formula containing 8 per cent. nicotine) and nicotine oleate with a bentonite fixative did not give effective control of eggs of any age, though, as in the case of nicotine sulphate, the ovicidal effect varied directly with the age of the eggs at the time of spraying.

In 1935–37, various nicotine sprays were tested against the adults [*cf.* **23** 41] released on apple trees. All quantities are given per 100 U.S. gals. All were about equally effective (average kill 72·5 per cent.) except 8 lb. nicotine bentonite (5 per cent. nicotine) without lime and 1½ U.S. pt. nicotine oleate with 4 lb. Fixator-A (a bentonite fixative), which were much inferior; when, however, the amount of fixative was reduced to 2 lb. so that only half the nicotine was combined with the bentonite, the kill compared favourably with that effected by sprays containing free nicotine or Black Leaf 40. The addition of hydrated lime [*cf.* **23** 41] to sprays containing Black Leaf 40 appeared slightly to increase effectiveness in 1937, but not in 1936. The addition of 1 lb. lime to 1 U.S. pt. Black Leaf 40 combined with 1 U.S. gal. oil emulsion (Orthol-K) appeared to increase the effectiveness very slightly. There was no evidence that lead arsenate increased the effectiveness of any of the sprays in which it was used.

In 1937, a comparison was made in two orchards, one chiefly York and the other chiefly Baldwin varieties, of triple acting schedules against eggs, larvae and adults, control being directed solely against the first brood. In one plot of both orchards, 3 lb. lead arsenate, 3 U.S. qts. Orthol-K emulsion and 1 U.S. pt. Black Leaf 40 was applied in the second and third cover sprays and the same without lead arsenate in the fourth; in another plot in the York orchard, 1½ U.S. pts. Black Leaf 40, 2 lb. bentonite and 3 U.S. qts. Orthol-K emulsion was applied for the second, third and fourth cover sprays; and in another plot of the Baldwin orchard, 1 U.S. pt. nicotine oleate, 2¼ lb. bentonite fixative, ⅞ U.S. pt. Black Leaf 40 and 3 U.S. qts. Orthol-K emulsion in the second and third cover sprays and the same with the Orthol-K increased to 1 U.S. gal. and the addition of 1½ lb. Coposil [copper ammonium silicate] as a fungicide in the fourth. All the trees had previously received a calyx spray of 3 lb. lead arsenate and a cover spray of 3 lb. lead arsenate and 1 U.S. pt. Black Leaf 40. The schedule including lead arsenate gave 95·3 per cent. uninjured fruit on York and 82·4 and 90·8 in two parts of the plot in the Baldwin orchard; the other schedules 86·9 and 60·9 per cent. in the two orchards. On control trees in the first orchard there were 42 per cent., and 4·8 per cent. on trees that received only a calyx spray in the second orchard, where infestation was particularly severe. On trees of the variety Wealthy interplanted with the Baldwin, the lead arsenate schedule gave 97·4 per cent. uninjured fruit, and the other schedule gave 91·9 per cent. The difference is attributed to the fact that Wealthy is less susceptible than Baldwin and that the fruit of the former was harvested one month earlier. The lead arsenate schedule is expensive and the residue difficult to remove. Ordinarily, the lead residue from the second schedule should not exceed 0·018 gr. per lb., but on Baldwins it was 0·03 gr. because the calyx spray was divided into two applications, the second of which was made when the apples were as large as or larger than marbles.

DRIGGERS (B. F.) & O'NEILL (W. J.). **Codling Moth Parasitism under different Spray Treatments.**—*J. econ. Ent.* **31** no. 2 pp. 221–223, 3 refs. Menasha, Wis., April 1938.

In experiments in New Jersey on the parasitism of the codling moth [*Cydia pomonella*, L.] under various spray treatments, plots sprayed with lead arsenate, fixed nicotine and oil, and fixed nicotine alone had no larvae parasitised by *Ascogaster carpocapsae*, Vier., in 1935, the first year of the experiment, and very few in 1936. In 1937, 9·9, 8·2 and 8·2 per cent. of the first brood and 14·8, 24·9 and 33·4 per cent. of the second brood were parasitised on the respective plots. In a survey at the end of the season in which sections of the orchard (which had been sprayed with lead arsenate) on either side of the experimental plots were included with the lead arsenate plot, the average percentages of parasitism were 5·2, 27·0 and 34·5, respectively. Infestation in this orchard was heavy. In an orchard with a medium infestation, samples were taken from a small plot in the middle sprayed with fixed nicotine and from others around sprayed with lead arsenate and oil, but no parasitised larvae were found in either.

HARMAN (S. W.) & MOORE (J. B.). **Further Studies with Lead Arsenate Substitutes for Codling Moth Control.**—*J. econ. Ent.* **31** no. 2 pp. 223–226. Menasha, Wis., April 1938.

For several years, nicotine sprays have consistently given most promise as substitutes for lead arsenate in the control of the codling moth [*Cydia pomonella*, L.] under conditions in New York, where a spray that will leave neither dangerous nor unsightly residue is required. This paper gives the results of orchard experiments during 1937 with the following: Black Leaf 155 (a proprietary mixture of bentonite and 5 per cent. nicotine), using 8 lb. per 100 U.S. gals. water or 4 lb. when combined with summer oil; Modified Black Leaf 155 (a modification of Black Leaf 155 containing soybean oil and karaya gum and 8 per cent. nicotine), using 5 lb. per 100 U.S. gals.; a tank-mixed nicotine bentonite, made by mixing 4 lb. of a bentonite fixator (Fixator A) and 1½ U.S. pints NOL 30 (a nicotine oleate solution containing 30 per cent. nicotine) in 100 U.S. gals. water (or 2 lb. fixator and ¾ pint NOL 30 when 2 U.S. quarts summer oil were used);

and a tank mixture of 1 pint nicotine sulphate (40 per cent. nicotine) with 2 or 3 quarts summer oil in 100 gals. water. All were compared with lead arsenate and zinc arsenate. The Black Leaf 155 and the nicotine bentonite mixture appeared to be about equally effective and almost as effective as lead arsenate. Zinc arsenate used for all cover sprays appeared to be inferior, but was a valuable non-lead spray for use in the lightly infested plantings. The tank-mixed nicotine bentonite left a heavy, conspicuous residue. Black Leaf 155 left a very light deposit, which was increased by the addition of sulphur as a fungicide to late applications, but all deposits from nicotine sprays were easily removed with a brush cleaner. Lead arsenate in the first cover spray, lead arsenate in the first and zinc arsenate in the second, or zinc arsenate in the first two cover sprays, followed by a nicotine mixture in the remainder of the schedule, gave commercial control and kept the residue of lead and arsenic below the tolerance. The combination of 4 lb. Black Leaf 155 with 2 or 3 U.S. quarts summer oil cost less than 8 lb. Black Leaf 155 without oil and was effective. Moreover, the oil made the visible residue from nicotine sprays less conspicuous. Too much oil or too many applications containing it tend, however, to dull the finish and retard colouring of the fruit. Modified Black Leaf 155 did not appear to possess any advantages over Black Leaf 155. Hydrated lime in the spray preceding the nicotine did not appear to have any influence on the effectiveness of the latter against light infestations. In the tank-mixed nicotine bentonite with oil, increasing the quantity of oil to 3 U.S. quarts had little effect on efficiency, but the addition of nicotine sulphate increased it considerably. A schedule in which one application of lead arsenate was followed by two or three of oil and nicotine and the programme completed with Black Leaf 155 was very efficient and left very little residue. Application of sulphur to prevent scab, after treatment with summer oil, caused considerable foliage injury on one variety, the amount being influenced by the number of oil treatments and the time elapsing between the application of oil and sulphur. The foliage of the other variety used in the experiments appeared to be less susceptible.

STEARNS (L. A.) & MACCREARY (D.). **Leafhopper Migration across Delaware Bay.**—*J. econ. Ent.* **31** no. 2 pp. 226–229, 2 refs. Menasha, Wis., April 1938.

A list is given of Jassids of 50 species and 33 genera taken on lighthouses 3, 6, 9 and 10 miles from the shore in Delaware Bay in 1936. The numbers taken at each lighthouse and the percentage of males and females are shown. The data obtained are discussed, and it is concluded that a natural barrier, such as Delaware Bay, is but a slight hindrance to insect migration when conditions are favourable to it.

SCHOENE (W. J.). **Ecological Studies of the White Apple Leafhopper,** *Typhlocyba pomaria* **McAtee.**—*J. econ. Ent.* **31** no. 2 pp. 229–232, 1 fig., 4 refs. Menasha, Wis., April 1938.

It has been observed in Virginia that *Typhlocyba pomaria*, McAtee, is much more numerous on the foliage of apple trees in sprayed than unsprayed orchards, particularly those where pruning, spraying, and the application of fertilisers are regularly practised. During 1934–37, a series of experiments was carried out in which adults of this leafhopper were placed on small trees that had been sprayed previously with one or more of the common insecticides and were allowed to oviposit. When trees were sprayed more than once, the second and third applications were made during the incubation period. When adults were placed on the freshly sprayed foliage, they deposited as many eggs as did those on unsprayed control trees, and when the trees were not sprayed again, as many nymphs developed as on the controls. Two or more applications of spray appeared to reduce the number of nymphs, but it is believed that the materials commonly used in apple orchards in the quantity applied would have very little effect upon feeding and oviposition, for when the second-brood nymphs emerge in August, the spraying season is past. Tests conducted in 1934 and 1935 in which very small nymphs were placed on sprayed foliage indicated that foliage heavily coated with Bordeaux mixture alone or with lead arsenate had an unfavourable effect on them. No information on the effect of sprays on the insect parasites of the leafhopper is available. Applications of lime-sulphur early in the season or heavy and frequent applications of Bordeaux mixture late in the season seemed to prevent the appearance of the fungus, *Entomophthora sphaerosperma*, which greatly reduced the number of leafhoppers in certain orchards in 1935 [*R.A.E.*, A **24** 298] and 1937. In 1936, which was a dry year, the fungus was not seen.

STEINER (H. M.). **Effects of Orchard Practices on Natural Enemies of the White Apple Leafhopper.**—*J. econ. Ent.* **31** no. 2 pp. 232–240, 2 figs., 8 refs. Menasha, Wis., April 1938.

A study was made in New York of the insect enemies of *Typhlocyba pomaria*, McAtee, in various types of apple orchard. During the years 1933–37, these orchards had leafhopper populations ranging from less than 10 to more than 1,000 per 100 leaves. Many of the orchards received most of the fungicidal and arsenical sprays recommended in the Hudson Valley up to the first cover spray against the codling moth [*Cydia pomonella*, L.], some received the second cover spray, and some sprays for the control of *T. pomaria*. Parasitism of overwintering eggs by the Mymarid, *Anagrus armatus* var. *nigriventris*, Gir., ranged from 68 to 96 per cent. and of eggs in foliage from 5 to 63 per cent. Parasitism by the Dryinid, *Aphelopus typhlocybae*, Mues., ranged from 1 to 80 per cent. The numbers of the predacious Capsid, *Diaphnidia pellucida*, Uhl., exceeded 12 per 100 leaves in some orchards, but it was extremely scarce in others. *Hyaliodes vitripennis*, Say, and other Capsids and Reduviids were less common. Many small spiders were common and may have contributed to control.

During the seasons covered by the study, nymphs of *T. pomaria* hatched from overwintered eggs in bark from the first week in May to the end of the second week in June, adults appeared from late May to early June and oviposited in foliage from mid-June to early August, first-generation nymphs hatched from eggs in foliage from early August to mid-September, and adults began to appear in late August. Eggs were laid in bark from mid-September until late October or November (leaf-fall). Individuals of *Anagrus* that overwinter in the pre-pupal stage emerge as adults in late April and early May, just before the leafhoppers hatch, but a much larger adult emergence from overwintering eggs occurs from mid-June to mid-July. Larvae remaining within the overwintering eggs in mid-July are full-grown and quiescent and are most numerous in branches within a few feet of the ground. They resume development in September and resultant adults emerge during September and October. The adults of the second period of emergence attack a portion of the host eggs in foliage. Parasitism of these eggs reached 82 per cent. in one orchard on 1st July 1936, and 65 per cent. in another on 2nd July 1937. Later oviposition by *T. pomaria* greatly reduced the percentage of parasitism. Adults emerge from these eggs in foliage from mid-July to early September and parasitise a portion of the remaining eggs in foliage, the final emergence occurring from mid-September until late October or November. Adults of the third period of emergence from eggs in bark and those of the second period of emergence from eggs in foliage parasitise eggs laid in bark. Adults of *Aphelopus* emerge in May and August and larval pouches are present in June-July and September-October [*R.A.E.*, A **24** 734]. *Diaphnidia* hatches from overwintering eggs in bark during May and from eggs in foliage from early July to early August. Adults oviposit in foliage from mid-June to mid-July and in bark from mid-September to late October.

The overwintering eggs of *T. pomaria* are usually most abundant in the bark of wood 2–8 years old. On young trees, the number of eggs in water sprouts not of the current season's growth was about equal to the number in branches of the same length and diameter, whereas on older trees, the number of eggs in water sprouts was many times greater than that in other branches of equal size. Where eggs were more numerous in water sprouts than in other branches, parasitism by *Anagrus* was lower ; the removal of water sprouts might aid control by eliminating a considerable proportion of the unparasitised eggs on a tree. In 3 orchards, part of each of which was cultivated in May 1936 and part left uncultivated, parasitism of adults by *Aphelopus* was consistently higher in the uncultivated than in the cultivated portions [*cf. loc. cit.*].

During May 1934 and 1935, it was observed that *Diaphnidia* was rarely found in orchards sprayed with lubricating oil emulsions, which kill its overwintering eggs. Population counts in one orchard in 1936 showed 2·3, 10·4 and 12·2 nymphs per 100 leaves on trees that had received dormant treatments of 3 per cent. lubricating oil emulsion or 3 per cent. tar oil emulsion and on untreated controls, respectively, and counts in another orchard in 1937 showed 0·6 and 7·2 nymphs per 100 leaves on trees treated with 3 per cent. lubricating oil and untreated controls. Dormant oils have not been observed to have toxic effects on overwintering eggs of *T. pomaria* or upon Mymarid parasites in them. During 1937, the effects of early foliage sprays on parasitism by *Aphelopus* were observed. No reduction in parasitism was attributed to the use of lead arsenate or wettable sulphur. Liquid lime-sulphur is believed to have reduced parasitism by killing the earlier-hatching and more heavily parasitised nymphs of *T. pomaria*. As the earlier-hatching nymphs give rise to a greater proportion of males than females, no great reduction in oviposition by the first generation can be expected from the application of liquid lime-sulphur as a calyx spray. Observations in two orchards showed that the percentage parasitism of the two generations of leafhoppers by *Aphelopus* was far higher among individuals that hatched before 25th May and 25th August, respectively. In collections covering 8 generations of *T. pomaria* from several orchards, the parasitism of male leafhoppers exceeded that of females.

The lowest percentage of parasitism of eggs in foliage occurred in orchards where spray was applied against leafhopper nymphs of the overwintered generation when only a few had reached the adult stage, probably on account of the destruction of leafhoppers that might otherwise have deposited eggs in the foliage before the second emergence of *Anagrus* was completed from overwintering host eggs. Greater parasitism might have been expected if spray applications had been delayed. Heavy early parasitism by *Aphelopus* may also reduce the number of eggs laid early and thus the degree of parasitism of eggs in foliage by *Anagrus*. Contact insecticides applied in May killed many of the smaller nymphs of *Diaphnidia*, but the larger nymphs and adults were not injured by the minimum concentrations necessary to kill leafhopper nymphs during the second week in June.

In an attempt to minimise injury to natural enemies, tests were made in 1936 and 1937 of sprays applied against leafhopper adults at the end of the first week in July. At this time, most of the *Aphelopus* larvae have left their hosts, the second emergence of *Anagrus* from overwintering eggs is almost complete and most of the *Diaphnidia* eggs have been laid. In 1936 and 1937, 40 and 65 per cent. of the leafhopper eggs, respectively, had been laid when the sprays were applied, and many leafhoppers appeared in the next generation, but fewer than in orchards not so sprayed. In 1936, one orchard received 1½ U.S. pints pyrethrum extract (containing 3 per cent. pyrethrins) per 100 U.S. gals. spray with 9 lb. hydrated lime and 3 lb. calcium arsenate included for the control of the apple maggot [*Rhagoletis pomonella*, Walsh] ; and in 1937, another received 3 lb. ground pyrethrum flowers (containing 0·9 per cent. pyrethrins) per 100 U.S. gals. spray with 6 lb. hydrated lime ; 80 and 90 per cent. kills were obtained. In the first orchard, the number of leafhopper eggs declined steadily for 3 generations following the application, and parasitism by *Anagrus* and *Aphelopus* increased in the first, remained high in the second and declined in the third, when the population of leafhoppers was extremely low. In the other orchard, the number of overwintering eggs was small and the number of larvae of *Aphelopus* in cocoons was large. When sprays are applied against second-brood nymphs before the completion of hatching, most of the *Aphelopus* are killed through the death of the leafhoppers. When the sprays are delayed until hatching has finished, some of the leafhoppers are adult, but these are chiefly males and are more heavily parasitised than the remaining ones. Sprays tested against nymphs of the second generation, which consisted of 1 U.S. pint nicotine sulphate per 100 U.S. gals. alone, with 3 lb. soap or with 1 U.S. gal. summer oil emulsion, or 1 lb. ground pyrethrum flowers (about 1·1 per cent. pyrethrins) per 100 U.S. gals. alone, with 2 lb. soap or 9 lb. hydrated lime, did not have an appreciable effect on the egg parasites in the bark or foliage. Sprays for the control of second-brood nymphs would normally be applied before the final emergence of egg parasites begins.

PAPERS NOTICED BY TITLE ONLY.

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